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=> fil wpiX
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MOST RECENT UPDATE:     201046        <201046/DW>
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>>> For changes in DWPI see HELP CHANGE - last updated April 6, 2010 <<<

>>> New display format ALLSTR available - see NEWS <<<

>>> US National Patent Classification thesaurus added - see NEWS <<<

=> d que l30
L3      19833 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON SELF(W)ASSEMBL?(
        W) (MONOLAYER? OR MONO(W)LAYER?)
L4      QUE SPE=ON ABB=ON PLU=ON SAM
L5      QUE SPE=ON ABB=ON PLU=ON SUBSTRATE
L6      QUE SPE=ON ABB=ON PLU=ON ARTICLE OR WORKPIECE OR WORK
        (W)PIECE
L9      QUE SPE=ON ABB=ON PLU=ON SURFACE
L12     QUE SPE=ON ABB=ON PLU=ON THERMAL?
L14     QUE SPE=ON ABB=ON PLU=ON ARYL OR AROMATIC?
L15     QUE SPE=ON ABB=ON PLU=ON ALICYCLIC?
L23     939 SEA FILE=WPIX SPE=ON ABB=ON PLU=ON (L3 OR L4) AND (L5
        OR L6)
L24     660 SEA FILE=WPIX SPE=ON ABB=ON PLU=ON L23 AND L9
L25     107 SEA FILE=WPIX SPE=ON ABB=ON PLU=ON L24 AND (L14 OR
        L15)
L26     15 SEA FILE=WPIX SPE=ON ABB=ON PLU=ON L25 AND L12
L27     15 SEA FILE=WPIX SPE=ON ABB=ON PLU=ON L26 AND L3
L28     QUE SPE=ON ABB=ON PLU=ON PROCESS OR METHOD
L29     13 SEA FILE=WPIX SPE=ON ABB=ON PLU=ON L27 AND L28
L30     11 SEA FILE=WPIX SPE=ON ABB=ON PLU=ON (L27 OR L29) AND
        (PY<=2006 OR PRY<=2006 OR AY<=2006)

=> d l30 ifull 1-11

L30 ANSWER 1 OF 11 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN
ACCESSION NUMBER: 2008-G25433 [200839] WPIX
DOC. NO. CPI: C2008-199378 [200839]
DOC. NO. NON-CPI: N2008-488461 [200839]
TITLE: Article used as heat sink in electronic
```

devices, has substrate comprising  
electrodeposited copper (alloy) foil, adherent  
layer comprising organophosphonate (salt), and  
functional layer comprising polymer(s) bound to  
adherent layer

DERWENT CLASS: A85; A92; A95; E11; L03; P73; U11; V04  
INVENTOR: BRUNER E; BRUNER E L; GRUBER G; GRUBER G W; HANSON  
E L  
PATENT ASSIGNEE: (ACUL-N) ACULON INC  
COUNTRY COUNT: 120

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2008039959	A2	20080403	(200839)*	EN	26[0]	
US 20080131709	A1	20080605	(200839)	EN		
WO 2008039959	A3	20081106	(200875)	EN		
JP 2010504874	W	20100218	(201014)	JA	20	

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2008039959	A2	WO 2007-US79802	20070928
US 20080131709	A1 Provisional 20060928	US 2006-827367P	
US 20080131709	A1	US 2007-862175	20070926
JP 2010504874	W PCT Application	WO 2007-US79802	20070928
JP 2010504874	W	JP 2009-530615	20070928

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
JP 2010504874	W Based on	WO 2008039959 A

PRIORITY APPLN. INFO: US 2007-862175 20070926  
US 2006-827367P 20060928

## INT. PATENT CLASSIF.:

IPC ORIGINAL: B32B0015-01 [I,A]; B32B0015-01 [I,C]; B32B0015-04  
[I,A]; B32B0015-04 [I,C]; B32B0015-08 [I,A];  
B32B0015-08 [I,C]; C09J0011-02 [I,C]; C09J0011-06  
[I,A]; C09J0201-00 [I,A]; C09J0201-00 [I,C]

USCLASS NCLM: 428/457.000  
NCLS: 156/151.000

## JAP. PATENT CLASSIF.:

MAIN: B32B0015-01 Z  
SECONDARY: C09J0011-06; C09J0201-00

FTerm CLASSIF.: 4F100; 4J040; 4F100/AA17.A; 4F100/AA18.A;  
4F100/AA19.A; 4F100/AA20.A; 4F100/AA21.A;  
4F100/AA22.A; 4F100/AA23.A; 4F100/AA25.A;  
4F100/AB02.A; 4F100/AB10.A; 4F100/AB12.A;  
4F100/AB13.A; 4F100/AB14.A; 4F100/AB15.A;  
4F100/AB16.A; 4F100/AB17.A; 4F100/AB18.A;  
4F100/AB22.A; 4F100/AB23.A; 4F100/AB24.A;  
4F100/AB25.A; 4F100/AB31.A; 4F100/AB31.B;  
4F100/AB33.B; 4F100/AH10.C; 4F100/AK05.D;  
4F100/AK07.D; 4F100/AK09.D; 4F100/AK12.D;  
4F100/AK15.D; 4F100/AK21.D; 4F100/AK22.D;

4F100/AK41.D; 4F100/AK43.D; 4F100/AK45.D;  
 4F100/AK46.D; 4F100/AK51.D; 4F100/AK53.D;  
 4F100/AL01.D; 4F100/AL09.D; 4F100/BA04; 4F100/BA07;  
 4F100/BA10.A; 4F100/BA10.D; 4F100/EH66; 4F100/EJ42;  
 4F100/EJ86; 4F100/GB32; 4F100/GB41; 4J040/HD21;  
 4J040/HD23; 4F100/JB02; 4F100/JL11; 4J040/MA02;  
 4J040/MA10; 4J040/MB03; 4J040/NA19

# BASIC ABSTRACT:

WO 2008039959 A2 UPAB: 20080620

**NOVELTY** - An article comprises a substrate having a surface and comprising an electrodeposited copper (alloy) foil, an adherent layer comprising organophosphonate (salt) covalently bound to the surface, and a functional layer comprising polymer(s) bound to the adherent layer.

**DETAILED DESCRIPTION** - An INDEPENDENT CLAIM is included for manufacture of article, which involves providing a substrate having a surface and comprising electrodeposited copper (alloy) foil, contacting the surface of the substrate with a composition comprising at least one phosphorous acid moiety chosen from organophosphonic acid, phosphonic acid, their conjugate base, and their salt, to form an adherent layer covalently bound to the surface, contacting the adherent layer with polymer(s) to covalently bind the polymer to the adherent layer and form a functional layer, and optionally, after contacting the adherent layer with the polymer, one or more steps chosen from polymer curing, polymer drying, and polymer heating.

**USE** - Article is used in devices equipped with heat source or electronic component (claimed), such as electronic circuitry, semiconductor chips, and insulated electrical wirings. The article is used as heat sink. Can also be used for components of aircraft and automobiles, containers used for beverages and foodstuffs, and engineering or construction applications.

**ADVANTAGE** - The article has an adherent layer which promotes adhesion between the substrate and functional layer. The functional layer provides thermal conductivity, insulation, electroconductivity, and/or corrosion resistance to the article.

# TECHNOLOGY FOCUS:

**ELECTRONICS - Preferred Devices:** A device is formed using a heat source and the article, or using an electronic component and the article. Preferred Method:

The polymer is electrophoretically deposited onto the adherent layer. Prior to contacting the adherent layer with the polymer, heating of adherent layer, removal of excess portion of the composition from the adherent layer, drying of adherent layer, and/or curing of adherent layer are carried out.

**INORGANIC CHEMISTRY - Preferred Substrate:** The substrate comprises an alloy of copper, or oxide, and other metal(s) chosen from silver, gold, nickel, palladium, platinum, zinc, titanium, zirconium, vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, iron, ruthenium, osmium, cobalt, zinc, cadmium, aluminum, tin, lead, magnesium, indium, arsenic, antimony, gallium, germanium, bismuth, selenium, tellurium, rhodium, iridium, thallium, silicon, rhenium, scandium and yttrium, and their oxides. The surface of the substrate is chemically or mechanically roughened. The substrate-surface further comprises oxide, salt, halide, sulfate, phosphate, hydroxide, chalcogenide, alkoxide, chloride, bromide, iodide, and/or sulfide of copper. The surface further comprises oxide, halide, sulfate, phosphate, hydroxide, chalcogenide, alkoxide, chloride, bromide, iodide, and/or sulfide of copper, silver, gold, nickel, palladium, platinum, zinc, titanium, zirconium, vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, iron, ruthenium, osmium, cobalt, zinc, cadmium, aluminum, tin, and/or lead.

METALLURGY - Preferred Foil: The copper (alloy) is electrodeposited onto a core material comprising an iron-nickel foil.

ORGANIC CHEMISTRY - Preferred Compound: The organophosphonate is derived from an organophosphonic acid moiety of formula (1), its conjugate base, or its salt.

R=1-40C optionally branched, optionally substituted, or (un)saturated aromatic, cyclic, or aliphatic group, optionally having carbon(s) replaced with heteroatom(s) chosen from sulfur, nitrogen, oxygen and phosphorus; and

R', R''=H or R.

The organophosphonic acid moiety is optionally substituted, optionally branched, or (un)saturated organophosphonic acid or its salt, and is chosen from alkylphosphonic acid, perfluoroalkylphosphonic acid, hydroxyalkylphosphonic acid, vinylalkylphosphonic acid, phosphonoalkylphosphonic acid, carboxyalkylphosphonic acid, sulfonoalkylphosphonic acid, aminoalkylphosphonic acid, amidoalkylphosphonic acid, siloxyalkylphosphonic acid, alkoxyalkylphosphonic acid, allylalkyl-aryl phosphonic acid, arylalkylphosphonic acid, aldehydealkylphosphonic acid, trifluoromethylalkylphosphonic acid, thioalkylphosphonic acid, epoxyalkylphosphonic acid, nitroalkylphosphonic acid, branched 3-40C phosphonic acid, unbranched 1-40C phosphonic acid, substituted 1-40C phosphonic acid, unsubstituted 1-40C phosphonic acid, saturated 1-40C phosphonic acid, unsaturated 2-40C phosphonic acid, aromatic 5-40C phosphonic acid, aliphatic 1-40C phosphonic acid, cyclic 3-40C phosphonic acid, 2-40C phosphonic acid having carbon(s) substituted by sulfur, 2-40C phosphonic acid having carbon(s) substituted by nitrogen, 2-40C phosphonic acid having carbon(s) substituted by oxygen, 2-40C phosphonic acid having carbon(s) substituted by phosphorus, and/or 1-40C phosphonic acid having carbon(s) substituted by two or more of sulfur, nitrogen, oxygen, phosphorus, and/or their salts. The organophosphonic acid moiety is chosen from 11-hydroxyundecylphosphonic acid, 11-acetoxyundecylphosphonic acid, 1-acetoxyundecylphosphonic acid, undec-11-enephosphonic acid, p-aminobenzylphosphonic acid, p-nitrobenzylphosphonic acid, 4-mercaptobutylphosphonic acid, butane-1,4-bisphosphonic acid, but-2-ene-1,4-bisphosphonic acid, o-phenolphosphonic acid, m-phenolphosphonic acid, p-phenolphosphonic acid, 2-methoxy-4-prop-2-enylphenol-6-phosphonic acid, 1-phosphonic acid-12-mercaptododecane, 1-phosphonic acid-12-(N-ethylamino)dodecane, 1-phosphonic acid-12-dodecene, p-xylylene diphosphonic acid, 1,10-decanediphosphonic acid, 1,12-dodecanediphosphonic acid, 1,14-tetradecanediphosphonic acid, 1-phosphonic acid-12-hydroxydodecane, 1-phosphonic acid-12-(N-ethylamino)dodecane, 1-phosphonic acid-12-dodecene, 1-phosphonic acid-12-mercaptododecane, 1,10-decanediphosphonic acid, 1,12-dodecanediphosphonic acid, 1,14-tetradecanediphosphonic acid, p,p'-biphenyldiphosphonic acid, 1-phosphonic acid-12-acryloyldodecane, 1,8-octanediphosphonic acid, 1,6-hexanediphosphonic acid, 1,4-butanediphosphonic acid, 1,8-octanediphosphonic acid, 1,6-hexanediphosphonic acid, 1,4-butanediphosphonic acid, aminetrimethylenephosphonic acid, ethylenediaminetetramethylenephosphonic acid, hexamethylenediaminetetramethylenephosphonic acid, diethylenetriaminepentamethylenephosphonic acid, 2-phosphonobutane-1,2,4-tricarboxylic acid, aniline phosphonic acid, bisphosphonic acid, olefin terminated phosphonic acid, octadecyl phosphonic acid, fluorophosphonic acid, and their salts.

The organophosphonate is of formula (2 or 3).

R, R' = as mentioned above;

a = covalent bond to surface; and

b = electron pair or bond surface, organophosphonate, organophosphonic acid, phosphonate, phosphonic acid, metal, ion, and/or neighboring molecule.

The organophosphonate is optionally substituted, optionally branched, or (un)saturated organophosphonate or its salt, and is chosen from alkylphosphonate, perfluoroalkylphosphonate, hydroxyalkylphosphonate, vinylalkylphosphonate, phosphonoalkylphosphonate, carboxyalkylphosphonate, sulfonoalkylphosphonate, aminoalkylphosphonate, amidoalkylphosphonate, siloxyalkylphosphonate, alkoxyalkylphosphonate, allylalkyl-aryl phosphonate, arylalkylphosphonate, aldehydealkylphosphonate, trifluoromethylalkylphosphonate, thioalkylphosphonate, epoxyalkylphosphonate, nitroalkylphosphonate, aniline phosphonate, bisphosphonate, olefin-terminated phosphonate, octadecyl phosphonate, fluorophosphonate, branched 3-40C phosphonate, unbranched 1-40C phosphonate, substituted 1-40C phosphonate, unsubstituted 1-40C phosphonate, saturated 1-40C phosphonate, unsaturated 2-40C phosphonate, aromatic 5-40 phosphonate, aliphatic 1-40C phosphonate, cyclic 3-40C phosphonate, 2-40C phosphonate having carbon(s) substituted by sulfur, 2-40C phosphonate having carbon(s) substituted by nitrogen, 2-40C phosphonate having carbon(s) substituted by oxygen, 2-40C phosphonate having carbon(s) substituted by phosphorus, 1-40C phosphonate having carbon(s) substituted by two or more of sulfur, nitrogen, oxygen and phosphorus, and/or their salts. The adherent layer further comprises at least one phosphorous acid moiety chosen from organophosphonic acid, phosphonic acid, their salts, their conjugate bases, and/or metal oxide. The adherent layer is free of chromium. The adherent layer comprises an omega -functional organophosphonic acid self-assembled monolayer. The phosphorous acid moiety is optionally bonded to the surface. The functional layer contains less than 0.1 weight% of organophosphonate, organophosphonic acid, phosphonic acid, and/or phosphonate.

**POLYMERS - Preferred Polymer:** The polymer in the functional layer is elastomer, epoxy, bisphenol-A epoxy, polyester, polycarbonate, polyphenol, polymercaptan, polyene, polyolefin, polypropylene, polyethylene, polybutylene, polyamide, polyether, polythiophene, polypyrrole, polyimide, polysulfone, polybenzimidazole, polybenzoxazole, poly(p-phenylene), polyquinoline, polyquinoxaline, polysulfide, poly(p-xylylene), polysiloxane, polyurethane, polyphosphazene, alkyd, acrylic, polyvinyl chloride, polystyrene, polyvinyl acetate, polyvinyl alcohol, and/or copolymer. The functional layer comprises dielectric polymer, conducting polymer, semiconducting polymer, thermally conductive polymer, thermally insulating polymer, light emitting polymer, adhesive polymer, minimally adhesive polymer, anticorrosive polymer, antifouling polymer, radiation-reflecting polymer, and/or polymer-impregnated fiber composite layer. The functional layer comprises a dielectric layer or polyepoxide coating.

FILE SEGMENT:

MANUAL CODE:

CPI; GMP; EPI

CPI: A12-E07; A12-E10; E05-E03B; E05-G02; E05-G03D; E05-G05; E31-G; E31-K05A; E31-K07; E31-L; E31-M; E31-P03; E34-B01; E34-C02; E34-E01; E35; L03-G07; L04-C25

EPI: U11-D02B; V04-T03A; V04-T03Q

L30 ANSWER 2 OF 11 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN  
 ACCESSION NUMBER: 2007-523945 [200751] WPIX  
 DOC. NO. CPI: C2007-193226 [200751]  
 DOC. NO. NON-CPI: N2007-401998 [200751]  
 TITLE: Article e.g. thin film transistor  
 comprises organic semiconductor material of  
 substituted N,N'-dicycloalkyl-naphthalene  
 tetracarboxylic diimide compound having  
 alicyclic ring system optionally  
 substituted by electron donating organic group  
 A85; E13; L03; P73; U11; U12  
 DERWENT CLASS: AHEAM W G; AHEARN W G; CAREY J T; FREEMAN D C;  
 INVENTOR: NELSON S F; SHUKLA D; AHEARN W; CAREY J; FREEMAN D;  
 NELSON S  
 PATENT ASSIGNEE: (EAST-C) EASTMAN KODAK CO  
 COUNTRY COUNT: 117

## PATENT INFORMATION:

PATENT NO	KIND DATE	WEEK	LA	PG	MAIN IPC
US 20070116895	A1 20070524	(200751)*	EN	14[2]	
WO 2007061614	A1 20070531	(200751)	EN		
EP 1952453	A1 20080806	(200854)	EN		
US 7422777	B2 20080909	(200860)	EN		
KR 2008073303	A 20080808	(200905)	KO		
JP 2009516930	W 20090423	(200929)	JA	27	
TW 2007033378	A 20070901	(200933)	ZH		

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20070116895 A1		US 2005-285238	
20051122			
EP 1952453 A1		EP 2006-836979	
20061107			
WO 2007061614 A1		WO 2006-US43200	
20061107			
EP 1952453 A1 PCT Application		WO 2006-US43200	
20061107			
KR 2008073303 A PCT Application		WO 2006-US43200	
20061107			
JP 2009516930 W PCT Application		WO 2006-US43200	
20061107			
JP 2009516930 W		JP 2008-542331	
20061107			
KR 2008073303 A		KR 2008-712156	20080521
TW 2007033378 A		TW 2006-142933	
20061121			

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
EP 1952453	A1 Based on	WO 2007061614 A
KR 2008073303	A Based on	WO 2007061614 A
JP 2009516930	W Based on	WO 2007061614 A

PRIORITY APPLN. INFO: US 2005-285238

29051122

INT. PATENT CLASSIF.:

IPC ORIGINAL:

B32B0027-00 [I,A]; B32B0027-00 [I,C]; B32B0027-00 [I,C]; C07D0471-00 [N,C]; C07D0471-06 [N,A]; C09K0019-00 [I,A]; C09K0019-00 [I,C]; G03C0005-00 [I,A]; G03C0005-00 [I,C]; H01L0021-02 [I,C]; H01L0021-322 [I,A]; H01L0029-02 [I,C]; H01L0029-02 [I,C]; H01L0029-08 [I,A]; H01L0029-08 [I,A]; H01L0029-66 [I,C]; H01L0029-66 [I,C]; H01L0029-72 [I,A]; H01L0029-786 [I,A]; H01L0031-04 [N,A]; H01L0031-04 [N,C]; H01L0051-00 [I,A]; H01L0051-00 [I,C]; H01L0051-05 [I,A]; H01L0051-05 [I,A]; H01L0051-05 [I,A]; H01L0051-05 [I,C]; H01L0051-05 [I,C]; H01L0051-30 [I,A]; H01L0051-40 [I,A]

ECLA:

H01L0051-00M6D2; H01L0051-05B2B6

ICO:

L82T0201:01; T01L0051:05B2B6; Y01N0004:00;

Y01N0006:00

USCLASS NCLM:

428/001.100

NCLS:

257/040.000; 257/E51.000; 257/E51.050; 428/473.500;

430/020.000; 430/311.000; 430/321.000; 438/099.000

JAP. PATENT CLASSIF.:

MAIN/SEC.:

C07D0471-06; H01L0029-28 100 A; H01L0029-28 250 H;

H01L0029-78 618 B; H01L0031-04 K

MAIN:

H01L0029-28 250 H

SECONDARY:

H01L0029-28 100 A; H01L0029-78 618 B

ADDITIONAL:

C07D0471-06; H01L0031-04 K

FTERM CLASSIF.:

4C065; 5F051; 5F096; 5F110; 5F151; 5F110/AA01; 5F110/AA05; 4C065/AA07; 5F110/AA17; 4C065/AA19; 5F110/BB01; 5F110/BB03; 5F110/BB04; 4C065/BB09; 5F110/CC03; 5F110/CC07; 4C065/CC09; 5F110/DD01; 4C065/DD02; 5F110/DD02; 5F110/DD05; 5F110/EE01; 4C065/EE02; 5F110/EE02; 5F110/EE03; 5F110/EE04; 5F110/EE08; 5F110/EE42; 5F110/EE43; 5F110/EE44; 5F110/FF01; 5F110/FF02; 5F110/FF03; 5F110/FF09; 5F110/FF22; 5F110/FF36; 5F110/GG05; 5F110/GG25; 5F110/GG28; 5F110/GG29; 5F110/GG42; 5F110/GG57; 4C065/HH09; 5F110/HK01; 5F110/HK02; 5F110/HK03; 5F110/HK04; 5F110/HK06; 5F110/HK08; 5F110/HK21; 5F110/HK32; 5F110/HK33; 5F051/JA20; 5F151/JA30; 4C065/JJ04; 4C065/KK09; 4C065/LL04; 4C065/PP04; 4C065/QQ01; 4C065/QQ02; 5F110/QQ06

BASIC ABSTRACT:

US 20070116895 A1 UPAB: 20090509

NOVELTY - An article (a1) in a thin film transistor comprises a thin film of organic semiconductor material having N,N'-dicycloalkyl-substituted naphthalene tetracarboxylic diimide compound with uncyanated naphthalene core; and directly attached to each imide nitrogen in the compound, a first and second alicyclic 4 - 10-membered ring system (where each of the ring systems and the naphthalene core optionally substituted; and each of the ring systems is substituted by at least one electron donating organic substituent).

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:

(1) an electronic device selected from integrated circuits, active-matrix display, and solar cells comprising a multiplicity of the thin film transistors (a1); and (2) fabricating (m1) the thin film semiconductor device involving depositing, onto a substrate, a thin film of n-channel organic semiconductor material that comprises the N,N'-dicycloalkyl-substituted-naphthalene tetracarboxylic diimide compound having an uncyanated naphthalene core, and attached directly to each imide nitrogen atom, a first and second

alicyclic 4 - 10-membered ring system (where optionally there are at least one substituent on one or both of the ring systems, which optional substituent if present include at least one electron donating organic substituent, such that the organic semiconductor material exhibits a field effect electron mobility that is greater than 0.01 cm<sup>2</sup>/Vs); forming a spaced apart source electrode and drain electrode, where the source and drain electrode are separated by, and electrically connected with, the n-channel semiconductor film; and forming a gate electrode spaced apart from the organic semiconductor material.

USE - In thin film transistors (claimed), which are useful as switching elements in electronics e.g. in active-matrix liquid-crystal displays, smart cards, and other electronic devices or their components. Also as semiconductor material in n-channel semiconductor films.

ADVANTAGE - The organic semiconductor materials when used in the form of an n-channel film, exhibit high performance under inert conditions without the need for special chemical underlayers; and are capable of exhibiting a field effect electron mobility greater than 0.01 (preferably greater than 0.1, especially greater than 1) cm<sup>2</sup>/Vs. The n-channel semiconductor film provides on/off ratios of at least 10<sup>4</sup>, advantageously at least 10<sup>5</sup>. The on/off ratio is measured as the maximum/minimum of the drain current as the gate voltage is swept from 0 - 80 volts and the drain-source voltage is held at a constant value of 80 volts, and employing a silicon dioxide gate dielectric.

#### TECHNOLOGY FOCUS:

ELECTRONICS - Preferred Components: The thin film transistor is a field effect transistor comprising a dielectric layer, gate electrode, source electrode and drain electrode in any sequence as long as the gate electrode and the thin film of organic semiconductor material both contact the dielectric layer, and the source electrode and the drain electrode both contact the thin film of organic semiconductor material. The thin film of organic semiconductor material is capable of exhibiting electron mobility greater than 0.01 cm<sup>2</sup>/Vs. The thin film transistor has an on/off ratio of a source/drain current of at least 10<sup>4</sup>. The gate electrode is adapted for controlling voltage which is applied to the gate electrode, a current between the source and drain electrodes through the thin film of organic semiconductor material. The dielectric layer comprises an inorganic or organic electrically insulating material. The thin film transistor additionally comprises a non-participating support that is optionally flexible. In the electronic device, the multiplicity of the thin film transistors is on a non-participating support that is optionally flexible. Preferred Method: In the method (m1), the compound is deposited on the substrate by sublimation, where the substrate has a temperature of not greater than 100 degrees C during deposition.

ORGANIC CHEMISTRY - Preferred Components: The N,N'-dicycloalkyl-substituted naphthalene tetracarboxylic diimide compound is of formula (I). The thin film of organic semiconductor material comprises N,N'-dicycloalkyl-substituted-1,4,5,8-naphthalene tetracarboxylic acid diimide compound of formula (II).

A1 and A2=optionally substituted alicyclic ring system comprising of 4 - 10 ring carbons in the ring system;  
m=0 - 4;

Y1=electron donating groups that do not adversely affect the n-type semiconductor properties of the film made from such compounds;

R1 - R10=H or an organic substituent (preferably H; and CH<sub>3</sub>, linear or branched 2-4C alkyl, alkenyl, alkoxy, or other 1-4C electron donating organic group);

Y2=a substituent that is not electron withdrawing and does not adversely affect the effective semiconductor properties of the



organic semiconductor material.

In the compound (I), both of the first and the second alicyclic ring system, in the structure, are substituted with at least one electron donating group, where either one or both of the first and the second alicyclic ring system are substituted by at least one electron donating group that is selected from CH<sub>3</sub>, linear or branched 2-4C alkyl, alkenyl, alkoxy, or other 1-4C electron donating organic group. The alicyclic ring systems are monocyclic rings or bicyclic alicyclic hydrocarbon rings; or are optionally substituted cyclohexyl or cyclopentyl ring. The Y1 groups on the naphthalene nucleus are selected from alkyl, alkenyl or alkoxy groups. In the compound (II) provided that:

(1) either both of the first and second alicyclic ring systems in the compound comprise at least one electron donating group that is an alkyl group; or are both monocyclic alicyclic ring systems having 5 - 6 carbon ring atoms (each optionally substituted by at least one electron donating group);

(2) either one or both of the first and the second alicyclic ring systems in the compound are cyclohexyl rings that are substituted by at least one electron donating group (preferably alkyl), where there is exactly one independently selected electron donating organic substituent on each of the two cyclohexyl rings, and either the substituents differ in identity and/or position or, if the substituents are the same in identity and position, the substituents are on in the ortho or meta position, not in the para position, on the cyclohexyl rings with respect to the imide nitrogen;

(3) at least two (preferably at least three) of R1 - R5 and at least two (preferably at least three) of R6 - R10 are H; and

(4) either all of R1, R3 - R6, R8 - R10 are H, and at least one of R2 and R7 is an alkyl; or all of R2 - R5, and R7 - R10 are H, and at least one of R1 and R6 are CH<sub>3</sub>.

Optionally any two adjacent R1 - R10 groups on a ring system combine to form 4 - 7-membered optionally substituted ring as part of a bridged alicyclic ring system (where any substitution on an alicyclic ring system in the compound includes at least one electron donating organic group) The electron donating groups and/or the Y2 groups are independently selected from alkyl, alkenyl, and alkoxy groups.

POLYMERS - Preferred Components: The source, drain, and gate electrodes each comprise a material selected from doped silicon, metal, or conducting polymer.

#### EXTENSION ABSTRACT:

SPECIFIC COMPOUNDS - N,N'-Dicyclohexyl-naphthalene-1,4,5,8 tetracarboxylic acid diimide (IA) and N,N'-dicyclopentyl-naphthalene-1,4,5,8 tetracarboxylic acid diimide are disclosed as the N,N'-dicycloalkyl-substituted naphthalene tetracarboxylic diimide compound.

EXAMPLE - A heavily doped silicon wafer with a thermally-grown SiO<sub>2</sub> layer with a thickness of 185 nm was used as the substrate. The wafer was cleaned for 10 minutes in a piranha solution, followed by a 6-minute exposure in a UV/ozone chamber. The cleaned surface was then treated with a self-assembled monolayer of octadecyltrichlorosilane (OTS), made from a heptane solution under a humidity-controlled environment. Water contact angles and layer thicknesses were measured to ensure the quality of the treated surface. Surfaces with a good quality OTS layer have water contact angles greater than 90degrees, and thicknesses determined from ellipsometry of 27 - 35 Angstrom. The purified N,N'-dicyclohexyl-1,4,5,8-naphthalene tetracarboxylic acid diimide (AI) was deposited by vacuum sublimation at a pressure of 2x10<sup>-7</sup> Torr and a rate of 0.5 Angstrom per second to a thickness of 25 nm as measured by a quartz crystal.

During deposition the substrate was held at a constant temperature of 90degreesC. The sample was exposed to air for a short time prior to subsequent deposition of gold (Au) source and drain electrodes through a shadow mask to a thickness of 50 nm. The device made had a 420 micron channel width, with channel lengths varying of 50 - 175 microns. Multiple organic thin film transistors (OTFTs) (test) were prepared. The devices were exposed to air prior to measurement in an argon atmosphere using Hewlett-Packard 4145B (RTM: semiconductor parameter analyzer). The average field effect mobility ( $\mu$ ) was calculated and found to be 3.67 cm<sup>2</sup>/Vs in the saturation region. The average on/off ratio was 1.4x10<sup>8</sup> and the average threshold voltage ( $V_t$ ) of 53.9 V. A comparative OTFT was prepared same as test, except that the compound (a1) was replaced with N,N'-dihexyl-1,4,5,8-naphthalene tetracarboxylic acid diimide. The obtained comparative device was tested same as test device, and showed the average mobility of 0.12 cm<sup>2</sup>/Vs in the saturation region, the average on-off ratio of 1.3x10<sup>6</sup>, and the average threshold voltage of 41.63 V.

FILE SEGMENT: CPI; GMPI; EPI  
 MANUAL CODE: CPI: A12-E07; E06-D18; L03-G05B6; L04-A04D;  
 L04-E01E  
 EPI: U11-C18A1; U12-B03A

L30 ANSWER 3 OF 11 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN  
 ACCESSION NUMBER: 2007-198319 [200720] WPIX  
 DOC. NO. CPI: C2007-072195 [200720]  
 DOC. NO. NON-CPI: N2007-145554 [200720]  
 TITLE: Fabrication of organic thin film transistor for  
 manufacturing display device comprises treating  
 surface of metal oxide source/drain  
 electrodes with self-assembled  
 monolayer forming compound containing  
 sulfonic acid group  
 DERWENT CLASS: A13; A14; A25; A26; A85; L03; U11; U12  
 INVENTOR: HAHN J S; HAN K M; JEONG E J; LEE S Y; LEE T W;  
 PARK H J  
 PATENT ASSIGNEE: (SMSU-C) SAMSUNG ELECTRONICS CO LTD; (HAHN-I) HAHN  
 J S; (HANK-I) HAN K M; (JEON-I) JEONG E J; (LEES-I)  
 LEE S Y; (LEET-I) LEE T W; (PARK-I) PARK H J  
 COUNTRY COUNT: 4

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20060289858	A1	20061228	(200720)*	EN	14[2]	
<--						
JP 2007013138	A	20070118	(200720)	JA	21	
CN 1893141	A	20070110	(200731)	ZH		
KR 2007000668	A	20070103	(200755)	KO		
US 7547574	B2	20090616	(200940)	EN		

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20060289858 A1		US 2005-297396	
20051209			
KR 2007000668 A		KR 2005-56196	20050628
CN 1893141 A		CN 2006-10087882	
20060526			
JP 2007013138 A		JP 2006-163101	
20060613			

US 7547574 B2  
20051209

US 2005-297396

PRIORITY APPLN. INFO: KR 2005-56196

20050628

INT. PATENT CLASSIF.:

IPC ORIGINAL:

H01L0021-02 [I,C]; H01L0021-28 [I,A]; H01L0021-336 [I,A]; H01L0029-40 [I,C]; H01L0029-417 [I,A]; H01L0029-66 [I,C]; H01L0029-66 [I,C]; H01L0029-786 [I,A]; H01L0051-00 [I,A]; H01L0051-05 [I,A]; H01L0051-05 [I,C]; H01L0051-05 [I,C]; H01L0051-05 [I,C]; H01L0051-30 [I,A]; H01L0051-40 [I,A]; H01L0051-40 [I,A]; H01L0051-40 [I,A]

ECLA:

H01L0051-10B2

ICO:

T01L0051:00M6D6; T01L0051:05B2B2B

USCLASS NCLM:

257/040.000; 438/099.000

NCLS:

257/040.000; 257/066.000; 438/099.000; 438/151.000

JAP. PATENT CLASSIF.:

MAIN/SEC.:

H01L0021-28 301 B; H01L0021-28 301 R; H01L0029-28 100 A; H01L0029-28 220 D; H01L0029-28 370; H01L0029-50 M; H01L0029-78 616 K; H01L0029-78 616 U; H01L0029-78 616 V; H01L0029-78 618 B

FTERM CLASSIF.:

4M104; 5F096; 5F110; 5F110/AA01; 4M104/AA09; 4M104/AA10; 4M104/BB02; 4M104/BB08; 4M104/BB09; 4M104/BB16; 4M104/BB18; 4M104/BB36; 4M104/CC01; 5F110/CC03; 5F110/DD01; 5F110/DD02; 5F110/DD05; 5F110/DD25; 4M104/DD77; 4M104/DD78; 5F110/EE01; 5F110/EE02; 5F110/EE03; 5F110/EE04; 5F110/EE07; 5F110/EE43; 5F110/EE44; 5F110/FF01; 5F110/FF02; 5F110/FF03; 5F110/FF27; 5F110/GG05; 4M104/GG09; 4M104/GG10; 4M104/GG14; 5F110/GG25; 5F110/GG42; 4M104/HH15; 5F110/HK01; 5F110/HK07; 5F110/HK21; 5F110/HK32

BASIC ABSTRACT:

US 20060289858 A1 UPAB: 20090629

NOVELTY - Fabrication of organic thin film transistor including a substrate (1), a gate electrode (2), a gate insulating layer (3), metal oxide source/drain electrodes (4, 5) and an organic semiconductor layer (7), comprises treating at least one surface of the metal oxide source/drain electrodes with a self-assembled monolayer (SAM) (6) forming compound containing a sulfonic acid group.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for: (1) an organic thin film transistor fabricated by the method; and (2) a display device comprising the organic thin film transistor.

USE - For fabricating an organic thin film transistor, e.g. bottom-contact organic thin film transistor, used for manufacturing a display device (claimed) e.g. electroluminescence device, liquid crystal device, and electrophoresis device.

ADVANTAGE - The surface of the source/drain electrodes of the organic thin film transistor may be changed to be more hydrophobic. By doing so, the metal oxide constituting the source/drain electrodes may have a higher work function than the organic semiconductor material. The organic thin film transistor may show superior electrical properties, particularly, a higher charge carrier mobility.

DESCRIPTION OF DRAWINGS - The figure is a cross-sectional view schematically showing the structure of an organic thin film transistor.

Substrate (1)

Gate electrode (2)

Gate insulating layer (3)

Metal oxide source/drain electrodes (4, 5) SAM (6)

Organic semiconductor layer (7) TECHNOLOGY FOCUS:

CERAMICS AND GLASS - Preferred Material: The substrate is made of glass.

INORGANIC CHEMISTRY - Preferred Material: The gate electrode is also made of indium-tin oxides (ITO). The gate insulating layer is also made of inorganic materials, preferably silicon nitride ( $\text{SiNx}$ ), silicon dioxides, or aluminum oxides. The metal oxide source/drain electrodes are made of ITO or indium-zinc oxide (IZO).  $x=0-4$ .

METALLURGY - Preferred Material: The substrate can be made of silicon. The gate electrode is made of gold, silver, aluminum, nickel, molybdenum, or tungsten.

ORGANIC CHEMISTRY - Preferred Component: The SAM forming compound containing a sulfonic acid group is of formula  $-(\text{A}(\text{R}_1)(\text{R}_2)-\text{B}(\text{R}_3)(\text{R}_4)-\text{X})_m-(\text{A}'(\text{R}_1')(\text{R}_2')-\text{B}'(\text{R}_3')(\text{R}_4'))_n-(\text{X}')_b$  (1),  $\text{X}_3-(\text{C}(\text{X}_1)(\text{X}_2))_o-(\text{C}(\text{Y}_1)(\text{Y}_2))_p-\text{SO}_3\text{H}$  (2), or group of formula (3). It contains a fluorine atom. The compound (1) is also of formula  $-(\text{CF}((\text{O}-\text{CF}(\text{CF}_3)-\text{CF}_2)_x-(\text{O}-\text{CF}_2-\text{CF}_2)_y-\text{SO}_3\text{H})-\text{CF}_2)_q-$  (4),  $-(\text{CF}((\text{O}-\text{CF}(\text{CF}_3)-\text{CF}_2)_w-(\text{O}-\text{CF}_2-\text{CF}_2)_z-\text{SO}_3\text{H})-\text{CF}_2)_t-(\text{CF}_2-\text{CF}_2)_y$  (5),  $-(\text{CF}((\text{O}-\text{CF}(\text{CF}_3)-\text{CF}_2)_v-(\text{O}-\text{CF}_2-\text{CF}_2)_c-\text{SO}_3\text{H})-\text{CF}_2)_r-(\text{CF}_2-\text{CF}_2)_s$  (6) or group of formula (7). The compound (2) can be  $\text{CF}_3(\text{CF}_2)_j\text{SO}_3\text{H}$ ,  $\text{CF}_3(\text{CH}_2)_j\text{SO}_3\text{H}$ ,  $\text{CF}_3(\text{CF}_2)_j(\text{CH}_2)_k\text{SO}_3\text{H}$ , or  $\text{CH}_3(\text{CF}_2)_j(\text{CH}_2)_k\text{SO}_3\text{H}$ . The compound (3) can be one or two compounds, e.g. group of formula (8).

$m, n, p, r, s, t, u, d, e=0-10000$ ;  
 $a, b=0-20$ ;  
 $\text{A}, \text{B}, \text{A}', \text{B}'=\text{C}, \text{Si}, \text{Ge}, \text{Sn}, \text{or Pb}$ ;  
 $\text{R}_1-\text{R}_4, \text{R}_1'-\text{R}_4'=\text{H}$ ; halo;  $\text{NO}_2$ ;  $\text{CN}$ ;  $\text{NH}_2$ , 1-30C (hetero)alkyl, 1-30C (hetero)alkoxy, 6-30C aryl, 6-30C arylalkyl, 6-30C aryloxy, 2-30C heteroaryl, 2-30C heteroarylalkyl, 2-30C heteroaryloxy, 5-20C cycloalkyl, 2-30C heterocycloalkyl, 1-30C alkylester, 1-30C heteroalkylester, 6-30C aryylester, or 2-30C heteroaryylester, all optionally substituted;  
 $\text{X}, \text{X}'=\text{single bond}$ ;  $\text{O}$ ;  $\text{N}$ ;  $\text{S}$ ; 1-30C alkylene, 1-30C heteroalkylene, 6-30C arylene, 6-30C arylalkylene, 2-30C heteroarylene, 2-30C heteroarylalkylene, 5-20C cycloalkylene, 5-30C heterocycloalkylene, 6-30C aryylester, or 2-30C heteroaryylester, all optionally substituted;  
 $o=1-10000$ ;  
 $\text{X}_1-\text{X}_3, \text{Y}_1, \text{Y}_2, \text{Z}=\text{H}, \text{F}$ , 6-30C aromatic group, or 5-30C heteroaromatic group interrupted by at least one hetero atom in which the aromatic and heteroaromatic groups are optionally substituted with 1-12C alkyl, alkoxy, ester, carboxylic, thiol and/or  $\text{NH}_2$ ;  
 $l, q=1-5$ ;  
 $x, y=0-10$ ;  
 $w, z, v, c, f=0-20$ ;  
 $j, k=1-20$ ; and  
 $i=1-4$ .

With the proviso that at least one of  $\text{R}_1-\text{R}_4$  contains a sulfonic acid group. Preferred Method: Treating at least one surface of the metal oxide source/drain electrodes with a SAM forming compound containing a sulfonic acid group is performed using a solution of the SAM forming compound in a solvent consisting of water and/or organic solvents. This method is performed at 10-150degreesC for 10 minutes to 1 hour. The method further includes acid-treating or UV-ozoneating the surface of the source/drain electrodes prior to treating with SAM forming compound containing a sulfonic acid group. The acid treatment is performed by impregnating the surface of the metal oxide source/drain

electrodes with an organic or inorganic acid solution at 15-35degreesC for 0.5-10 seconds. The UV ozonation is performed by irradiating the surface of the metal oxide source/drain electrodes using a lamp having a power of 0.28 W/cm<sup>2</sup> at a wavelength of 254 nm for 1-30 minutes. The method further includes annealing after treating the surface of the source/drain electrodes with the SAM forming compound. The annealing is performed at 50-200degreesC for 10 minutes to 1 hour. Preferred Composition: The solution of the SAM forming compound contains 0.001-20 weight% of the SAM forming compound containing a sulfonic acid group based on a total weight of the solution. Preferred Material: The organic solvent is alcohol, ethanol, ether, chlorinated alkane, aromatic solvent, and/or glycol.

POLYMERS - Preferred Material: The substrate is also made of plastic. The gate electrode is made of polythiophenes, polyanilines, polyacetylenes, polypyrroles, polyphenylene vinylenes, or polyethylenedioxythiophene (PEDOT)/polystyrenesulfonate (PSS) mixtures. The gate insulating layer is made of polyolefins, polyvinyls, polyacrylates, polystyrenes, polyurethanes, polyimides, polyvinylphenols or their derivatives. The organic semiconductor layer is made of pentacenes, tetracenes, copper phthalocyanines, polythiophenes, polyanilines, polyacetylenes, polypyrroles, polyphenylene vinylenes, or their derivatives.

#### EXTENSION ABSTRACT:

EXAMPLE - Aluminum was deposited on clean glass substrate by a sputtering technique to form a gate electrode having a thickness of 1500 Angstrom . Polyvinylphenol containing a crosslinking agent was spin-coated on it at 1000 rpm to a thickness of 5000 Angstrom , and soft-baked at 100degreesC for 5 minutes to form a gate insulating layer. Indium-tin oxide (ITO) was deposited on the insulating layer to a thickness of 1000 Angstrom by a thermal evaporation method, and was then subjected to photolithography to form an ITO electrode pattern. At this time, the deposition was conducted under a vacuum pressure of  $2 \times 10^{-7}$  torr, a substrate temperature of 50degreesC and at a deposition rate of 0.85 Angstrom /sec. Subsequently, the ITO electrode was surface-treated by impregnating it with a self-assembled monolayer (SAM) forming solution at room temperature for 30 minutes to form an organic thin film transistor. The SAM forming solution was prepared by dissolving 5 weight% (based on a total weight of the solution) of a Nafion(RTM: perfluorinated resin solution) in a mixed solvent (55 weight% ethanol and 45 weight% water). That is, the SAM forming solution consisted of 5 weight% Nafion(RTM: perfluorinated resin solution) and 95 weight% mixed solvent, and the mixed solvent consisted of 55 weight% ethanol and 45 weight% water. Pentacene was deposited on the SAM and on the insulating layer to a thickness of 1000 Angstrom by a thermal evaporation method under a vacuum pressure of  $2 \times 10^{-7}$  torr, a substrate temperature of 50degreesC and at a deposition rate of 0.85 Angstrom /sec.

FILE SEGMENT: CPI; EPI  
MANUAL CODE: CPI: A11-B05; A12-E07C; A12-E11A; L04-A04; L04-E01E  
EPI: U11-C18A1; U12-B03A; U12-B03C

L30 ANSWER 4 OF 11 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN  
ACCESSION NUMBER: 2006-478229 [200649] WPIX  
CROSS REFERENCE: 2008-F33733  
DOC. NO. CPI: C2006-150894 [200649]  
DOC. NO. NON-CPI: N2006-388802 [200649]  
TITLE: Formation of self-assembled  
monolayer configured for use as diffusion  
barrier in interconnect structure, by selectively

depositing first self-assembled monolayer on copper surface, and second self-assembled monolayer on dielectric surface

DERWENT CLASS: E19; L03; U11

INVENTOR: SUTCLIFFE V; WHELAN C

PATENT ASSIGNEE: (TEXT-C) TEXAS INSTR INC; (SUTC-I) SUTCLIFFE V; (WHEL-I) WHELAN C; (ITUV-C) INTERUNIV MICRO-ELECTRONICA CENT VZW

COUNTRY COUNT: 37

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20060128142	A1	20060615	(200649)*	EN	19[9]	
<--						
EP 1670054	A1	20060614	(200649)	EN		
<--						
US 7368377	B2	20080506	(200834)	EN		

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20060128142	A1	Provisional	US 2004-634900P
20041209			
US 20060128142	A1		US 2005-296033
20051207			
EP 1670054	A1		EP 2005-447275
20051208			

PRIORITY APPLN. INFO: US 2005-296033 20051207  
US 2004-634900P 20041209

## INT. PATENT CLASSIF.:

IPC ORIGINAL: H01L0021-02 [I,C]; H01L0021-31 [I,A]; H01L0021-4763 [I,A]; H01L0021-70 [I,C]; H01L0021-768 [I,A]

ECLA: H01L0021-285B4H2; H01L0021-312L; H01L0021-768B2D; H01L0021-768C; H01L0021-768C3; H01L0021-768C3B

ICO: L82T0201:01P; Y01N0006:00

USCLASS NCLM: 438/638.000; 438/643.000

NCLS: 257/E21.171; 257/E21.584; 438/778.000

## BASIC ABSTRACT:

US 20060128142 A1 UPAB: 20091214

NOVELTY - Formation of a self-assembled monolayer, configured for use as a diffusion barrier in an interconnect structure, comprises: selectively depositing a first self-assembled monolayer (13) on a copper surface (4); selectively depositing a second self-assembled monolayer on a dielectric surface; and heating a substrate to remove the first self-assembled monolayer.

DETAILED DESCRIPTION - Formation of a self-assembled monolayer (SAM), configured for use as a diffusion barrier in an interconnect structure, comprises: providing a substrate having an opening(s), which comprises a bottom part and a sidewall(s), the bottom part having a copper surface and the sidewall having a dielectric surface(s); selectively depositing a first SAM on the copper surface; selectively depositing a second SAM on the dielectric surface; and heating the substrate to remove the first SAM, where remaining second SAM is configured for use as a diffusion barrier in an interconnect structure. An INDEPENDENT CLAIM is also included for a diffusion barrier layer

in an interconnect structure, where diffusion barrier is SAM comprising molecules of formula  $\text{SH}(\text{CH}_2)_{10}\text{Si}(\text{CH}_3)_3$  or  $\text{SH}(\text{CH}_2)_9\text{CH}_3$ .  
 USE - The method is for formation of a SAM configured for use as a diffusion barrier in an interconnect structure. The SAM is configured to act as a protecting layer for copper surface in interconnect structure. It is selectively deposited onto a dielectric part(s) of a damascene structure i.e. dual damascene structure useful for a semiconductor device (claimed) or integrated circuits.  
 ADVANTAGE - The method achieves improved electrical and reliability characteristics of SAM copper diffusion barriers when applied to dual damascene copper interconnects.  
 DESCRIPTION OF DRAWINGS - The figure shows dual damascene integration structures before and after selective SAM integration.  
 Copper surface (4)  
 First dielectric layer (10) Second dielectric layer (11) First self-assembled

monolayer (13)

#### TECHNOLOGY FOCUS:

ELECTRONICS - Preferred Method: Heating the substrate is conducted at above 100, preferably 100-150degreesC for greater than or equal to 1 minute, where first SAM has a low thermal stability at above 100degreesC.

Preferred Component: The semiconductor device comprises a direct copper-to-copper contact between copper at a bottom of a via and copper in a trench of an underlying level.

INORGANIC CHEMISTRY - Preferred Component: The dielectric surface is a silicon (Si)-based dielectric material.

ORGANIC CHEMISTRY - Preferred Component: The first and second SAM comprise first and second molecules, where each first and second molecule comprises a first and a second molecule head group, a first and a second molecule chain portion, and a first and a second molecule terminal group, respectively, where first and second molecule chain portions comprise a hydrocarbon.

The first head group adheres more strongly to the copper surface than to the dielectric surface, where first terminal group adheres weakly to the copper surface and adheres weakly to the dielectric surface, and where first molecule has a low thermal stability. The second head group adheres more strongly to the dielectric surface than to the copper surface, where second terminal group adheres weakly to the dielectric surface and strongly to the copper surface.

The first SAM comprises molecules having a chemical formulae consisting of  $\text{X-R}_1\text{-SH}$  (I),  $\text{X-R}_1\text{-S-S-R}_2\text{-Y}$  (II) and/or  $\text{R}_1\text{-S-R}_2$  (III).

$\text{R}_1$ ,  $\text{R}_2$  = carbon chain, a carbon chain interrupted by heteroatom(s), or a chain of n carbon atoms, a chain of n carbon atoms interrupted by p heteroatoms;

X, Y = chemical groups that do not chemically react with the copper surface;

X = methyl or H;

n, n+p = 1-30, preferably 6-16.

The carbon chain comprises a portion consisting of alkyl, alkenyl, alkynyl, cyclic alkyl, aryl, alkyl bound to aryl, alkenyl bound to aryl, and/or alkynyl bound to aryl. The second self-assembled monolayer is of formula  $(\text{Z})_3\text{SiR}_3\text{SH}$  (IV).

$\text{R}_3$  = carbon chain, a carbon chain interrupted by at least one heteroatom, a chain of n carbon atoms, or a chain of n carbon atoms

interrupted by p heteroatoms;  
Z = CH<sub>3</sub>, Cl, C<sub>2</sub>H<sub>5</sub>, OCH<sub>3</sub>, or OC<sub>2</sub>H<sub>5</sub>.

## EXTENSION ABSTRACT:

EXAMPLE - SAM-1 was prepared by immersion of copper plated wafer substrates in a dilute solution of 1-decanethiol. The dilute solution was obtained by dilution of 1 ml of concentrated 1-decanethiol in 5000 ml solvent, using isopropyl alcohol (IPA) as solvent at ambient temperature for 2 hours. The SAM-1 material had 96% purity. The 10C-modified wafer was then rinsed with amounts of IPA (30 seconds) and dried under nitrogen. The substrates were then electroplated with copper. The copper substrates were cleaned by immersion in 3.7% hydrochloric acid for 5 minutes, followed by rinsing with amounts of deionized water (2 min.) and then solvent (30 s) immediately before immersion in thiol solution. SAM-2 was prepared by rinsing silicon dioxide (SiO<sub>2</sub>) substrate in toluene (10 s) and then immersion in a dilute solution of mercaptopropyltrimethoxy-silane. The dilute solution was obtained by dilution of 10 ml of concentrated mercaptopropyltrimethoxy-silane (MPTMS) in 5000 ml solvent, using toluene as solvent at ambient temperature for 1 hour. The MPTMS-modified wafer was then rinsed with amounts of toluene (30 s), then, acetone (30 s) and, finally, ethanol (30 s) before being dried under nitrogen flow.

## FILE SEGMENT:

CPI; EPI

## MANUAL CODE:

CPI: E05-E02; E10-A04A; E10-E03L; E10-E03M;  
E10-H01B; L04-C10; L04-C13B  
EPI: U11-C05D3; U11-C12; U11-D03B2

L30 ANSWER 5 OF 11

WPIX COPYRIGHT 2010

THOMSON REUTERS on SIN

ACCESSION NUMBER:

2005-664931 [200568] WPIX

DOC. NO. NON-CPI:

N2005-544598 [200568]

TITLE:

Surface-modified layer system production  
method involves treating polymorphic  
self-assembled monolayer  
anchored on substrate, thermally  
, to change structural form of SAM

DERWENT CLASS:

P42

INVENTOR:

BUCK M; CYGANIK P

PATENT ASSIGNEE:

(UYSA-N) UNIV ST ANDREWS; (BUCK-I) BUCK M; (CYGA-I)  
CYGANIK P

COUNTRY COUNT:

107

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2005092516	A1	20051006	(200568)*	EN	24	[7]
<--						
GB 2426724	A	20061206	(200680)	EN		
<--						
US 20070140901	A1	20070621	(200741)	EN		
GB 2426724	B	20080903	(200858)	EN		

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2005092516 A1		WO 2005-GB1159	
20050324			
GB 2426724 A		GB 2006-18673	20060922
US 20070140901 A1		US 2006-594654	
20060926			
GB 2426724 A PCT Application		WO 2005-GB1159	



20050324  
 US 20070140901 A1 PCT Application WO 2005-GB1159  
 20050324  
 GB 2426724 B PCT Application WO 2005-GB1159  
 20050324  
 GB 2426724 B GB 2006-18673 20060922

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
GB 2426724	A Based on	WO 2005092516 A
GB 2426724	B Based on	WO 2005092516 A

PRIORITY APPLN. INFO: GB 2004-6841

20040326

INT. PATENT CLASSIF.:

IPC ORIGINAL: B05D0001-18 [I,A]; B05D0001-18 [I,C]; B05D0003-02 [I,A]; B05D0003-02 [I,C]; B05D0003-06 [I,A]; B05D0003-06 [I,C]; G01N0031-22 [I,A]; G01N0031-22 [I,C]

IPC RECLASSIF.: B05D0001-18 [I,A]; B05D0001-18 [I,C]; B05D0003-02 [I,A]; B05D0003-02 [I,C]; B05D0005-00 [N,A]; B05D0005-00 [N,C]

ECLA: B05D0007-24

ICO: L05D0001:18C; L05D0003:02S; L05D0005:00;

L05D0202:40; L82T0201:01S; L82T0201:01T;

Y01N0006:00

422/057.000

USCLASS NCLM:

BASIC ABSTRACT:

WO 2005092516 A1 UPAB: 20051223

NOVELTY - The method involves treating polymorphic self-assembled monolayer (SAM)

(1) anchored on substrate (2), thermally, to change the structural form of the SAM.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for surface-modified layer system.

USE - For producing surface-modified layer system (claimed), using thermo-lithographic technique.

ADVANTAGE - Effectively increases structural perfection of thermally-treated SAM with significantly increased domain size and resistance to structural disruption by surface discontinuities in the substrate surface.

DESCRIPTION OF DRAWINGS - The figure shows a schematic view explaining the SAM

patterning process. SAM (1)

substrate (2)

pattern (3)

laser radiation (4)

TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - The substrate is made of indium phosphide, gallium arsenide, and alloys and oxides, including glass.

METALLURGY - The substrate is made of material selected from a group consisting of gold, silver, chromium, manganese, vanadium, tungsten, molybdenum, zirconium, titanium, platinum, aluminum, iron and steel.

ORGANIC CHEMISTRY - The substrate is made of indium phosphide, gallium arsenide, and alloys and oxides, including glass.

ORGANIC CHEMISTRY - The SAM which is 4-(4'-methyl-biphenyl-4-yl)-alkane-1-thiol, comprises anchor moiety and optionally substituted aryl e.g. hetero-aryl

moiety. The anchor moiety is selected from thio, seleno, carboxyl, phosphonate, phosphate and hydroxyl. The aryl moiety is selected from phenyl, biphenyl and terphenyl, and fused ring systems selected from anthracryl and naphthyl, and hetero-aryl selected from bipyridyl, terpyridyl, thiophenyl, bithienyl, terthienyl and pyrrolyl and alicyclic moieties selected from bridged alicyclic systems such as bi-, tri- or tetracycloalkanes. The aryl moiety has substituent selected from halogen, carboxy, trifluoromethyl, thiol, hydroxy, cyano, amino, nitro, C1 to C6 alkyl and carbonyl.

FILE SEGMENT: GMPI

L30 ANSWER 6 OF 11 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN  
 ACCESSION NUMBER: 2004-430162 [200440] WPIX  
 CROSS REFERENCE: 2004-095982; 2005-028796  
 TITLE: Formation of self-aligned pattern on existing pattern on substrate by applying a coating of masking material to top surface of substrate, and allowing portion of masking material to attach to portions of existing pattern to top surface  
 DERWENT CLASS: A85; E19; L03; U11  
 INVENTOR: COLBURN M E; GATES S M; HEDRICK J C; HUANG E; NITTA S V; PURUSHOTHAMAN S; SANKARAPANDIAN M  
 PATENT ASSIGNEE: (IBM-C) INT BUSINESS MACHINES CORP  
 COUNTRY COUNT: 1

PATENT INFORMATION:

PATENT NO	KIND DATE	WEEK	LA	PG	MAIN IPC
US 20040087177	A1 20040506	(200440)*	EN	20[8]	
<--					

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20040087177	A1 Div Ex	US 2002-287935	
20021105			
US 20040087177	A1	US 2003-421355	
20030424			

FILING DETAILS:

PATENT NO	KIND	PATENT NO
US 20040087177	A1 Div ex	US 6641899 B

PRIORITY APPLN. INFO: US 2002-287935 20021105  
 US 2003-421355 20030424

INT. PATENT CLASSIF.:  
 IPC RECLASSIF.: G03F0007-16 [I,A]; G03F0007-16 [I,C]  
 ECLA: G03F0007-16L  
 USCLASS NCLM: 438/758.000  
 NCLS: 428/195.100; 438/778.000; 438/780.000

BASIC ABSTRACT:

US 20040087177 A1 UPAB: 20090327  
 NOVELTY - A self-aligned pattern on an existing pattern on a substrate having a top surface is formed by applying a coating of the masking material to the

top surface of the substrate; and allowing a portion of the masking material to preferentially attach to portions of the existing pattern to the top surface.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(a) a structure comprising a self aligned pattern on an existing pattern on a substrate; and (b) a composition for selectively coating a pattern on a substrate, comprising a carrier material for application to the substrate; and a polymer in the carrier that reactively grafts to regions of the substrate having first chemical characteristics.

The self-aligned pattern includes a masking material having an affinity for portions of the existing pattern, so that the masking material preferentially reactively grafts to the portions of the existing pattern.

USE - For forming a self-aligned pattern on an existing pattern on a substrate.

ADVANTAGE - The self-aligned pattern is fabricated accurately and inexpensively without the use of lithography. The use of self-aligned masks allows a simplified fabrication process in which the effective dielectric constant between metal lines can be reduced through selective application of various materials to the metal lines. This is central to maximizing the propagation speed of interconnect signals and ultimately provides faster overall circuit performance. Further, the inventive method leads to a higher level of protection and reliability of interconnect structures as the errors attributed to conventional patterning methods are eliminated and to reduced processing costs. The use of the self-aligned masks allows a unique process in which the masks can be generated without the need to perform additional pattern defining steps. DESCRIPTION OF DRAWINGS - The figure is a cross sectional view of a semiconductor device.

Interconnect structure (30) Interlayer dielectric (31)

Metal wiring (32)

Liner barrier layer (34)

Cap barrier layer (36)

#### TECHNOLOGY FOCUS:

ELECTRONICS - Preferred Component: The pattern applied to the top surface comprises a first set of regions of the substrate having a first atomic composition, and a second set of regions of the substrate having a second atomic composition different from the first composition. The masking material comprises a self-assembled monolayer that selectively binds to the second set of regions of the pattern. The first set of regions includes one or more metal elements. The second set of regions includes a dielectric. The areas of second atomic composition are patterned electrical interconnects. The substrate is a silicon wafer containing microelectronic devices, a ceramic chip carrier, an organic chip carrier, a glass substrate, a gallium arsenide substrate, a silicon carbide substrate, a semiconductor wafer, a circuit board, or a plastic substrate. The masking material also includes a reactive molecule having functional groups for polymerization propagation; a composition where polymerization proceeds by reactions that combine monomers and polymers having two or more functionalities that react with each other to produce polymers of a larger molecular weight; or the reactive molecule, where reaction of the reactive molecule with the portion of the pattern generates a layer having reactive groups, which participate in step growth polymerization. The structure further comprises conductive feature(s) formed on the substrate; and conductive barrier layer(s). The substrate further comprises insulating layer(s) surrounding the conductive feature. The conductive barrier layer is disposed at interface(s) between the insulating layer and the conductive

feature. The insulating layer surrounds the conductive feature at its bottom and lateral surfaces.

**Preferred Method:** The method further comprises applying a reactive monomer to the layer of functional groups so that the reactive monomer polymerizes on the layer, applying the reactive monomer which undergoes polymerization on the layer, or applying the reactive monomer having one or more functionalities to the layer to form a self-aligned mask layer; preparing a polymer to act as the masking material; forming a condensed phase containing the polymer or the reactive molecule, and contacting the portions of the pattern with the condensed phase; preparing the reactive molecule or the reactive monomer; removing the masking material from the portions of the pattern to which it does not attach; and chemically treating regions of the substrate prior to applying the coating. The polymerization comprises a chain growth mechanism wherein polymerization proceeds through addition of a monomer to a reactive polymer. The removing step is accomplished through rinsing, ultrasonication, dissolution, thermolysis, irradiation, or annealing. The masking material is applied to the substrate by a spin coating, scan coating, dip coating or spray coating, or using a doctor blade. The chemically treating step includes plasma treatment, application of an oxidizing or reducing solution, annealing in a reducing or oxidizing atmosphere, or application of a material that renders surface portions of the substrate, to which it is applied, to be hydrophobic or hydrophilic; and applying an organosilane comprising SixLyRz. It changes the wetting characteristics of the regions of the substrate. The reactive monomer polymerizes when exposed to a free radical, an anion, a cation, and a transition metal catalyst; or polymerizes when exposed to thermal annealing or irradiation. The reactive molecule or reactive monomer is prepared in a vapor phase. The irradiating step includes exposure to ultraviolet light, visible light, x-rays, or electrons.

L = hydroxy, methoxy, ethoxy, acetoxy, alkoxy, carboxy, amines, or halogens; and

R = hydrido, Me, Et, vinyl, or Ph (any alkyl or aryl).

**POLYMERS - Preferred Material:** The masking material comprises a polymer containing a reactive grafting site that selectively binds to the second set of regions of the pattern applied to the top surface; or a polymer that is generated from the reactive molecule that binds to the portions of the pattern to provide a molecular monolayer of functional groups.

**Preferred Component:** The coating comprises a polymer that covalently bonds to the portions of the pattern. The polymer is poly(oxides), poly(carbonates), poly(esters), poly(anhydrides), poly(urethanes), poly(sulfonates), poly(siloxanes), poly(sulfides), poly(thioethers), poly(thioesters), poly(sulfones), poly(sulfonamides), poly(amides), poly(imines), poly(ureas), poly-(phosphazene), poly(silanes), poly(siloxanes), poly(silazane), poly(nitriles), poly(imides), poly(oxazole), poly(benzoxazole), poly(thiazoles), poly(pyrazoles), poly-(triazoles), poly(thiophenes), poly(oxadiazole), poly(thiazine), poly(thiazoles), poly(quinoxaline), poly(benzimidazoles), poly(oxindoles), poly(indolines), poly(pyridines), poly(triazines), poly(piperazine), poly(pyridines), poly(piperidines), poly(pyrrolidines), poly(carborane), poly(fluoresceins), poly(acetals), or poly(anhydrides). The polymer is an amorphous polymeric system having any chain architecture; a main chain

acyclic hetero-atom polymer; a main chain heterocyclic polymer; or one of linear, networked, branched, and dendrimeric. It has an acyclic main chain, a carbon containing backbone, and a reactive functional group serving as the grafting site.

ORGANIC CHEMISTRY - Preferred Component: The functional group is acyl chlorides, anhydrides, hydroxy, esters, ethers, aldehydes, ketones, carbonates, acids, epoxies, aziridines, phenols, amines, amides, imides, isocyanates, thiols, sulfones, halides, phosphines, phosphine oxides, nitros, azo, benzophenones, acetals, ketals, diketones, or the organosilanes. The reactive monomer comprises a monomeric ring. It is dienes, alkene, acrylics, methacrylic, acrylamides, methacrylamides, vinyl ethers, vinyl alcohols, ketones, acetals, vinyl esters, vinyl halide, vinyl nitrile, styrene, vinyl pyridine, vinyl pyrrolidone, vinyl imidazoles, vinyl heterocyclics, cyclic lactam, cyclic ether, cyclic lactones, cycloalkene, cyclic thioester, cyclic thioether, aziridines, phosphazine, siloxane, oxazoline, oxazine, thirane, caprolactone, propylene glycol, or a substituted ethylenic organic molecule. The reactive molecule is bi-functional. It includes a first moiety that binds to the portions of the pattern; and a second moiety that serves as a polymerization initiator, a monomeric unit, or a reaction site. It is deposited as a thin layer or a molecular monolayer. The first moiety is acyl chloride, anhydride, hydroxy, ester, ether, aldehyde, ketone, carbonate, acid, epoxy, aziridine, phenol, amine, amides, imides, isocyanates, thiols, sulfones, halides, phosphines, phosphine oxides, nitros, azo, benzophenones, acetals, ketals, diketone, or the organosilane; or the organosilane, hydroxy, acyl chloride, or carboxylic acid. The second moiety comprises a substituted ethylenic organic molecule, or a monomeric ring. It is dienes, alkenes, acrylics, methacrylic, acrylamides, methacrylamides, vinyl ethers, vinyl alcohols, ketones, acetals, vinyl esters, vinyl halide, vinyl nitrile, styrene, vinyl pyridines, vinyl pyrrolidone, vinyl imidazoles, vinyl heterocyclics, styrene, cyclic lactams, cyclic ethers, cyclic lactones, cycloalkenes, cyclic thioesters, cyclic thioethers, aziridines, phosphazines, siloxanes, oxazolines, oxazine, or thirane; amines, nitrites, alcohols, carboxylic acids, sulfonic acids, isocyanate, acyl chloride, ester, amide, anhydride, epoxy, halide, acetoxo, vinyl, or silanol; or peroxide, nitroxide, halide, azo, perester, thioester, hydroxy, metal organics having the stoichiometry of  $RX$ . The one or more functionalities react with each other to form a covalent bond. The functionalities are provided by one or more functional groups from amines, nitriles, alcohols, acids, carboxylic acids, sulfonic acids, isocyanates, acyl chlorides, esters, amides, anhydrides, epoxies, halides, acetoxo, vinyl, or silanol. The condensed phase is a liquid. The liquid is a solvent for the polymer, a solvent for the reactive molecule, or a solvent for the reactive monomer.

$R$  = benzyl, cumyl, butyl, alkyl, or naphthalene; and  
 $X$  = sodium, lithium, and potassium; protonic acids, Lewis acids, carbenium salts, tosylates, triflates, benzophenones, aryldiazonium, diaryliodonium, triarylsulfonium, acetals, ketals, or diketones.

INORGANIC CHEMISTRY - Preferred Component: The areas of second atomic composition comprise copper.

FILE SEGMENT:	CPI; EPI
MANUAL CODE:	CPI: A11-B05; A12-E07C; E05-A; E05-E; E10-A01; E10-A03B; E10-A04B1B; E10-A04B1D; E10-A04B2B; E10-A04B2D; E10-A09B4; E10-A09B8; E10-A16B; E10-A23B; E10-E04; E10-F02; E10-F02A2; E10-G01;

E10-H04; E31-P06B; E31-P06E; E35-A; L04-C06;  
L04-C10A  
EPI: U11-C04B; U11-C05D3

L30 ANSWER 7 OF 11 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN  
ACCESSION NUMBER: 2004-033953 [200403] WPIX  
DOC. NO. CPI: C2004-011148 [200403]  
DOC. NO. NON-CPI: N2004-027002 [200403]  
TITLE: Modifying electrodes in array of electrodes by  
binding respective probe molecule to electrodes to  
be modified, dissociating respective probe molecule  
from electrode and contacting each electrode with  
respective liquid  
B04; D16; S02; S03  
DERWENT CLASS: KUNWAR S; MATHAI G T; PISHARODY S; SCABOO K  
INVENTOR: (GENO-N) GENORX INC; (KUNW-I) KUNWAR S; (MATH-I)  
PATENT ASSIGNEE: MATHAI G T; (PISH-I) PISHARODY S; (SCAB-I) SCABOO K  
COUNTRY COUNT: 105

## PATENT INFORMATION:

PATENT NO	KIND DATE	WEEK	LA	PG	MAIN IPC
US 20030224387	A1 20031204	(200403)*	EN	34[11]	
<--					
WO 2004061133	A1 20040722	(200448)	EN		
<--					
AU 2003300277	A1 20040729	(200477)	EN		
<--					

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20030224387	A1 Provisional	US 2002-382074P	
20020522			
US 20030224387	A1	US 2002-327868	
20021226			
AU 2003300277	A1	AU 2003-300277	
20031222			
WO 2004061133	A1	WO 2003-US41002	
20031222			

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
AU 2003300277	A1 Based on	WO 2004061133 A

PRIORITY APPLN. INFO: US 2002-327868 20021226  
US 2002-382074P 20020522

INT. PATENT CLASSIF.:  
IPC RECLASSIF.: G01N0033-543 [I,A]; G01N0033-543 [I,C]  
ECLA: G01N0033-543K2B  
USCLASS NCLM: 435/006.000  
NCLS: 205/777.500

## BASIC ABSTRACT:

US 20030224387 A1 UPAB: 20050527  
NOVELTY - Modifying (M1) electrodes (I) in an array of electrodes involves  
overlying each of at least two electrodes (II) to be modified with a

respective protective molecule (III), binding respective probe molecule to (II) and dissociating (III) from a electrode overlaid by a protective molecule and contacting each of electrodes in several subsets of (I) with a respective liquid.

DETAILED DESCRIPTION - Modifying (M1) electrodes (I) in an array of electrodes involves overlying each of at least two electrodes (II) to be modified with a respective protective molecule (III) such that (III) inhibits probe molecules from binding to the two electrodes, binding respective probe molecule to (II), and:

(a) dissociating (III) from a electrode overlaid by a protective molecule and contacting each of electrodes in several subsets of (I) with a respective liquid, where each liquid comprises a respective different probe molecule, and an electrode is subjected to both steps of dissociating and contacting the respective different probe molecule of the respective liquid which binds to the electrode;

(b) contacting several of (I) with a liquid (IV) and dissociating a protective molecule from one of the electrodes in contact with (IV) where the probe molecule of (IV) binds to the electrode which is subjected to contacting and dissociating steps; and

(c) addressing one of (I) with a dissociation potential and contacting (I) with a liquid comprising a probe molecule or a protective molecule, where one of probe molecule and one of the protective molecule bind to the first electrode. INDEPENDENT CLAIMS are also included for the following: (1)

modifying (M2) electrodes in an array of electrode pairs, where each electrode pair comprises a first and second electrode involves overlaying each of the first and second electrodes in a electrode pair with (III) such that (III) inhibits probe molecules from binding to the two electrodes, binding respective probe molecule to the first and second electrodes of the electrode pairs, dissociating a protective molecule from the first electrode of the electrode pair without dissociating a protective molecule from the second electrode of the electrode pair, and contacting the first and second electrode of the electrode pair in the array of electrode pair with a liquid comprising a first probe molecule, where the first and second electrodes of the electrode pair being spaced apart by less than 1000 Å and the first probe molecule of the liquid binds to the first electrode; (2) forming (M3) an electrical connection between first electrode and a second electrode of an electrode pair involves binding a first molecule to the first electrode where the first molecule comprises a first single stranded polynucleotide, binding a second molecule to the second electrode where the second molecule comprises an intercalating group configured to intercalates with double stranded polynucleotides, and contacting the electrode pair with a second single stranded polynucleotide at least partially complementary to the first polynucleotide, where the first and second polynucleotides form a duplex region and the intercalating group intercalates with the duplex region thus forming the electrical connection between the first and second electrodes; (3) preparing (M4) a sensor involves binding a first molecule to a first electrode, binding a second molecule to a second electrode, where if the first electrode pair is contacted with a liquid comprising a second single stranded polynucleotide sequence at least partially complementary to the first polynucleotide sequence, the first and second polynucleotide sequences will form a duplex region and the intercalating group will intercalate with the duplex region thus modifying an electrical characteristic of the first and second electrodes, thus the presence of the at least partially complementary polynucleotide may be determined;

(4) an apparatus (V) for preparing an array of modified surfaces comprising a device configured to contact electrodes of each of a number N subsets of electrodes an array of electrodes with a respective liquid, where each liquid comprises a respective different compound and N is an integer greater than 1 and for each subset of the N subsets of electrodes modify an electrical potential between at least a first electrode of the subset of electrodes and a

reference electrode, thus the respective compound of the fluid contacting the first electrode binds to the first electrode; and (5) a sensor comprising a substrate which comprises a first electrode pair comprising first and second electrode, first molecule comprising first polynucleotide, bound with first electrode, and a second molecule comprising a group configured to intercalate with double stranded polynucleotide compounds, bound with second electrode.

USE - (M1) is useful for preparing sensors that are useful for detecting a wide range of macromolecules as well as macromolecules binding events.

DESCRIPTION OF DRAWINGS - The figure shows the top view of an exemplary

biosensor.

#### TECHNOLOGY FOCUS:

BIOTECHNOLOGY - Preferred Method: In (M1), at least 2, 25 or 100 electrodes that are subjected to both dissociating and contacting steps are members of respective different subsets of electrodes. The contacting step is performed after dissociating step for some subsets in the several of the subsets of electrodes that comprise at least 2 or 5 member electrodes but fewer than 50 or 25 member electrodes. The dissociating step is performed while the subsets of electrodes are in contact with the respective liquids in the contacting step for at least some subsets in the several of the subsets of electrodes. Contacting step further comprises contacting each subset of a first portion in the several of the subsets with the respective liquid, while the subsets in the first portion of subsets remain in contact with the respective liquids, contacting each subset of a second different portion in the several of the subsets with the respective liquid. While performing the contacting step, at least 25 or 100 of the subsets of electrodes in simultaneous contact with the respective liquid comprises a respective different molecule. The contacting step involves simultaneously contacting at least some subsets in the several of the subsets of the electrodes with the respective liquid where the respective liquids comprise at least two different liquids. The dissociating step involves modifying an electrical potential difference between the electrode and a reference electrode for each electrode in several of the electrodes, thus a respective protective molecule dissociates from the electrode. The contacting step further involves contacting a respective, different reference electrode with the respective liquid for each of at least two subsets in the several of the subsets of electrodes, thus electrically contacting the electrodes in the subset of electrodes and the reference electrode or respective different reference electrode. The liquid used in contacting step does not electrically connect the subset with the respective reference electrodes of other subsets of electrodes. The contacting step further involves applying a droplet of liquid to the subset of electrodes and reference electrode where each droplet of liquid comprises a respective different probe molecules. (M1) further involves repeating the dissociating and contacting steps until a respective probe molecule is bound to each of at least 50 or 500 electrodes of the array. (M1) further comprises prior to performing the steps of dissociating and contacting, overlaying a several of the electrodes with a protective molecule by contacting the electrodes with a liquid comprising a protective molecule, where a protective molecule binds to electrodes of the array. The protective molecule is chosen from one of the alkylsiloxane, an alkanethiol containing 1-22 carbon atoms and a fatty acid. A respective protective molecule is bound to the each electrode in a several of electrodes, by a sulfur group. The probe molecules comprises a polynucleotide and a binding portion that binds the



electrodes, where the polynucleotides bound to different electrodes have different sequences from one another and the binding portion comprising sulfur. The array of electrodes comprises a several of electrode pairs, where the first and the second electrodes of the electrode pairs in the array are spaced apart preferably by less than 500 Å. The dissociating step comprises dissociating the a respective protective molecule from only the first electrode of the electrode pair where the electrode pairs belong to different subsets of the several of subsets of electrodes and the contacting step comprises contacting at least two electrode pairs with respective liquids comprising respective different probe molecules, where for each electrode pair of the two electrode pairs, contacted with respective liquids comprising respective different probe molecules where only the first electrode of the electrode pair is also subjected to the dissociating step, thus the respective different probe molecule of the respective liquid binds only to the first electrode, second electrode of the electrode pair, and contacting both electrodes of the electrode pair with a liquid comprising a probe molecule to be bound to the second electrode of the electrode pair, where the probe molecule to be bound to the second electrode is different from the probe molecule bound to the first electrode, and the probe molecule to be bound to the second electrode of electrode pair binds to the second electrode. The probe molecule bound to one of the first and second electrode comprises the first polynucleotide. The probe molecule bound to the other electrode comprises an intercalating group, where upon contacting the electrode pair with a liquid comprising a target polynucleotide at least partially complementary to the first polynucleotide of the probe molecule bound to the first electrode an electrical resistance between the first and second electrodes will be reduced. The dissociating step is performed without removing the liquid used in the contacting step, where the dissociating step comprises modifying an electrical potential of a electrode or modifying an electrical potential of a electrode and a reference electrode, thus a molecule dissociates from the electrode. (M1) further involves addressing a different electrode with a dissociation potential, contacting electrodes in the array with a liquid comprising different probe molecule, contacting electrodes of the array with a liquid comprising a protective molecule, addressing a electrode in the array of electrodes with dissociation potential where one electrode that was subjected to addressing step and contacting step while not concurrently being subjected to addressing step and contacting step, contacting electrodes in the array of electrodes with a liquid comprising a different probe molecule and contacting electrodes in the array of electrode with a liquid comprising a protective molecule. The addressing step comprises modifying an electrical potential difference between a electrode and a reference electrode. The addressing step dissociates the protective molecule from the electrode. In (M2), the first probe comprises a polynucleotide or a phosphorothiolated polynucleotide. The second probe molecule comprises an intercalating group configured to intercalate with double stranded polynucleotides. In (M3), the second molecule comprises a conductive oligomer disposed intermediate the intercalating group and a second portion of the second molecule that is associated with the second electrode, where the second molecule is free of polynucleotides. The binding of the first and the second molecule to the first and the second electrode comprises binding a sulfur group of the first and second molecule to the first and second electrode, respectively. The intercalating group

comprises ethidium bromide, acridine or a derivative of ethidium bromide or acridine. Prior to the step of binding the first molecule or second molecule to the first electrode or second electrode, overlaying the protective molecule upon the first electrode or second electrode, thus the protective molecule inhibits the association of first and second molecule with the first electrode or second electrode. The step of binding the first molecule or the second molecule to the first electrode or second electrode involves contacting the first and second electrodes with the liquid comprising the first molecule and modifying an electrical potential difference between the first electrode or second electrode and a reference electrode, thus protecting the first electrode or second electrode. Binding of the first molecule comprising respective different first polynucleotides to the first electrodes of respective different electrode pairs thus the first polynucleotide bound to different first electrodes will selectively from duplex regions with different second polynucleotides. The step of binding a first or second molecule to the first or second electrode involves contacting at least two subsets or number N subsets of the electrode pairs with respective liquid or respective different second molecule and modifying an electrical potential difference between the first electrode or second electrode of one of the electrode pairs and a reference electrode thus respective first molecule or second molecule binds to the first electrode or second electrode where N is an integer greater than one and less than Na. In (M4) contacting the subset with respective liquid involves applying aliquot of the respective liquid to the subset, where the electrode pairs of each subset of electrode pairs or isolated from aliquots of liquid applied to other subsets of electrode pairs. (M4) further involves determining an electrical characteristic such as conductance, resistance, an impedance or an capacitance of the first and second electrodes thus the presence of the second polynucleotide may be determined. The second molecule comprises a conductive oligomer disposed intermediate to the intercalating group and a portion of the second molecule that is bound to second electrode, where conductive oligomer comprises a saccharide and an aromatic group.

Preferred Apparatus: (V) is configured to repeatedly contact subsets of surfaces in the array of surfaces with a respect liquid where each liquid comprises a respective different compound, and modify an electrical potential between the electrode in the subset of electrodes and a reference electrode until a respective different compound has been bound with each electrode in the array of electrodes. (V) further comprises several of droplet preparation devices, where each droplet preparation device is in fluid communication with a respective reservoir that comprises a respective one of the different compounds, and a droplet delivery device configured to deliver droplets prepared by the droplet preparation devices to predetermined subsets in the N subsets of electrodes, thus contact the predetermined subsets with respective liquid. The droplet preparation device comprises a capillary configured to prepare a droplet of fluid, where the droplet preparation devices are configured to prepare droplets by the thermally modifying pressure of the liquid, piezo-electrically modifying the pressure of the liquid and ultrasonically modifying a pressure of the liquid. The device is configured to bind one respective protective molecule to the electrodes of the array, where the respective protective compound inhibits association of the respective different compounds with electrodes. A sensor comprising.

Preferred Sensor: The substrate comprises a number Na electrode pairs, each electrode pair comprising a first and second electrode pair, a first molecule bound with the second electrode, the first molecule comprising a first polynucleotide, a second molecule bound with the second electrode, the second molecule comprising a group configured to intercalate with double stranded polynucleotide compounds, and where upon contacting the electrode pair with a liquid comprising a second polynucleotide sequence at least partially complementary to the first and second polynucleotide sequences form a duplex region and the intercalating portion intercalates with the duplex region thereby modifying an electrical characteristic of the first and second electrodes where the presence of the at least partially complementary second polynucleotide may be determined. The different first polynucleotides are found with the first electrodes of respective different electrode pairs, thus the first polynucleotides bound to different first electrodes will selectively form duplex regions with different second polynucleotides.

## EXTENSION ABSTRACT:

EXAMPLE - Bare gold electrodes were cleaned by contacting the electrodes with a solution of 70% sulfuric acid and 30% hydrogen peroxide for one minute to remove organic surface contaminants. Each electrode within the array was protected by forming a self-assembled monolayer of a thiol containing compound on the electrodes. The self-assembled monolayers were prepared by exposing the electrodes of the array to an aqueous solution of 1 mM mercapto hexanol for 1-4 hours. Electrodes of the array were contacted with ethanol to remove any mercapto hexanol molecules which were not non-covalently bound to the electrodes. Electrodes of the array were addressed to deprotect individual electrodes by removing the mercapto hexanol. An electrode to be deprotected was contacted with an aqueous solution comprising 0.1 M potassium hydroxide for 100 seconds. A step voltage of -1.2 volts versus a reference electrode was applied to an electrode which was a silver/chloride electrode, although other reference electrodes may be used. Only electrodes addressed by modifying the potential difference between the electrode and the reference electrode were deprotected. Upon deprotecting an electrode, electrodes of the array were exposed to a liquid comprising a high ionic strength buffered solution of a thiol-terminated oligonucleotide for 1-4 hours. The thiol-terminated oligonucleotide reacted with the surfaces of electrodes that had been deprotected by desorbing the mercapto hexanol to form a self assembled layer of the thiol-terminated oligonucleotide. Mercaptohexanol bound to electrodes that had not been deprotected inhibited adsorption of the thiol-terminated oligonucleotide thereto. The electrodes of the array were then re-exposed to a liquid comprising 1 mM mercapto hexanol for one hour and rinsed with water to prepare, at the surfaces of the deprotected electrodes, a stable phase capable of supporting hybridization to the thiol-terminated oligonucleotides. The steps of deprotecting one or more electrodes and attaching a thiol-terminated oligonucleotide were terminated oligonucleotide had been formed at the surface of each electrode within the array. The modified array may be exposed to a liquid comprising oligonucleotides at least partially complementary to the thiol-terminated electrodes of the electrode array. Hybridization between a thiol-terminated electrode and a partially complementary oligonucleotide may be determined by monitoring an electrical characteristic, such as a capacitance of each electrode within the array. Thus, the modified electrode array may be used to determine the presence of a several of polynucleotides.

FILE SEGMENT:	CPI; EPI
MANUAL CODE:	CPI: B04-E01; B11-C08; B12-K04F; D05-H09; D05-H10
	EPI: S02-C01B4; S03-E03; S03-E14H

L30 ANSWER 8 OF 11 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN  
ACCESSION NUMBER: 2003-787166 [200374] WPIX

CROSS REFERENCE: 2003-720714; 2007-199550  
 DOC. NO. CPI: C2003-217162 [200374]  
 DOC. NO. NON-CPI: N2003-630766 [200374]  
 TITLE: Thin film transistor device includes organic semiconductor layer comprising polycyclic aromatic compound consisting of oligothiophene, perylene, benzo(ghi)perylene, coronene, or polyacene formed from thermal conversion of their precursor  
 A85; E19; L03; U11; U12  
 DERWENT CLASS: AFZALI-ARDAKANI A; BREEN T L; DIMITRAKOPOULOS C D  
 INVENTOR: (IBM-C) INT BUSINESS MACHINES CORP  
 PATENT ASSIGNEE: 1  
 COUNTRY COUNT: 1

## PATENT INFORMATION:

PATENT NO	KIND DATE	WEEK	LA	PG	MAIN IPC
US 20030136964	A1 20030724	(200374)*	EN	23[6]	
US 6963080	B2 20051108	(200573)	EN		

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20030136964	A1 Provisional	US 2001-333312P	
US 20030136964	A1	US 2002-300630	

PRIORITY APPLN. INFO: US 2002-300630 20021120  
 US 2001-333312P 20011126

## INT. PATENT CLASSIF.:

## IPC RECLASSIF.:

C07D0487-00 [I,C]; C07D0487-08 [I,A]; C07D0495-00 [I,C]; C07D0495-08 [I,A]; C07D0498-00 [I,C]; C07D0498-08 [I,A]; C07D0513-00 [I,C]; C07D0513-08 [I,A]; H01L0021-02 [N,C]; H01L0021-316 [N,A]; H01L0051-00 [I,A]; H01L0051-00 [I,C]; H01L0051-05 [N,A]; H01L0051-05 [I,C]; H01L0051-30 [I,A]; H01L0051-40 [I,A]

## ECLA:

C07D0487-08; C07D0495-08; C07D0513-08; H01L0051-00A2B; H01L0051-00M6D6

## ICO:

L82T0201:01; M07D0487:08; M07D0487:08+237C+237C+2; M07D0495:08; M07D0495:08+335C+335C+2; M07D0498:08; M07D0498:08+265C+265C+2; M07D0513:08; M07D0513:08+279C+279C+2; T01L0021:316D; T01L0051:00A2B; T01L0051:00M2B2; T01L0051:05B2B; T01L0051:05B2B2; T01L0051:05B2B2D; T01L0051:05B2B2E; Y01N0006:00

## USCLASS NCLM:

## NCLS:

257/040.000; 257/072.000  
 257/066.000; 257/E21.272; 257/E51.006; 257/E51.007; 257/E51.029

## BASIC ABSTRACT:

US 20030136964 A1 UPAB: 20060120

NOVELTY - A thin film transistor device includes conducting gates, gate insulator, organic semiconductor layer on insulator layer overlapping with gate electrodes, and sets of conductive source and drains. The organic semiconductor layer is polycyclic aromatic compound consisting of

oligothiophene, perylene, benzo(ghi)perylene, coronene, or polyacene formed from thermal conversion of their precursor.

**DETAILED DESCRIPTION** - A thin film transistor device (10) includes conductive gate electrodes on a substrate (20); gate insulator layer on the gate electrode; organic semiconductor layer (40) on the insulator layer overlapping with the gate electrodes; and sets of conductive source and drain electrodes on the semiconductor layer such that each set is in alignment with each of the gate electrodes. The organic semiconductor layer is polycyclic aromatic compound consisting of oligothiophene, perylene, benzo(ghi)perylene, coronene, or polyacene formed from thermal conversion of their precursor.

An **INDEPENDENT CLAIM** is also included for preparing the above thin film transistor by sequentially depositing on a substrate, conducting gate electrodes, gate insulator layer, polycyclic aromatic compound precursor overlapping the gate electrodes, and sets of conductive source and drain electrodes; and heating the assembly to convert the polycyclic aromatic compound precursor to a polycyclic aromatic compound.

**USE** - Used as thin film transistor devices.

**ADVANTAGE** - The inventive thin film transistor device can be processed at low temperature with combined ease of deposition of thin films over large areas due to the solubility of the Diels-Alder adducts, thus providing an inexpensive approach of producing the transistor devices. The low temperature processing enables the fabrication of organic thin film transistors on plastic substrates that are lightweight and possess mechanical flexibility and ruggedness.

**DESCRIPTION OF DRAWINGS** - The figure shows the device after the substrate has been heated to convert the precursor to pentacene thin film.

Thin film transistor device (10) Substrate (20)

Contacts (31-33)

Dielectric layer (30)

Organic semiconductor layer (40) **TECHNOLOGY FOCUS:**

**ORGANIC CHEMISTRY** - Preferred Components: The precursor is a Diels-Alder adduct of the polycyclic aromatic compound with a dienophile of formula  $R1X=YR2$  (I).

X, Y = N or CR7;

R1X = O, S, SO, or SO2;

R1, R2, R7 = H, 1-12C alkyl, optionally substituted aryl, aralkyl, alkoxy, carbonyl, aryloxy, carbonyl, acyl, or a group R;

R = H, 1-12C alkyl, alkoxy, acyl, aryl, aralkyl, chloroalkyl, fluoroalkyl, or substituted aryl having a substituent consisting of F, Cl, Br, NO2, CO2R, PO3H, SO3H, trialkylsilyl, or acyl of formula R8CO, preferably benzyl, 1-5C alkyl, chlorinated 1-4C alkyl, or fluorinated 1-4C alkyl; and

R8 = H, 1-12C alkyl, optionally substituted aryl, aralkyl, or fluoroalkyl;

At least one of X or Y is heteroatom consisting of N, O, or S.

The polycyclic aromatic compound is a polyacene of formula (1), preferably (2).

R3-R6 = H, 1-12C alkyl, or optionally substituted aryl, where R3+R4 and R5+R6 form at least one fused benzo ring; and

n = at least 1.

When the dienophile is of formula (I), the Diels-Alder adduct is preferably of formulae (i)-(iv).

The dienophile may be an N-sulfinylamide of formula RC(O)NS=O, and the Diels-Alder adduct of formulae (v) or (vi).

The dienophile may be an azodicarboxylate of formula ROC(O)N=NC(O)OR, and the Diels-Alder adduct of formulae (vii)-(ix).

Preferred Material: A monolayer comprising

hexamethyldisilazane, aminopropyl triethoxysilane, or alkyl trichlorosilane is applied onto the gate insulator layer before deposition of the precursor.

A self-assembly monolayer comprising alkylthiol, alkyl phosphonic acid or alkyl hydroxamic acid is applied onto the surface of the source and drain electrodes.

ELECTRONICS - Preferred Condition: The device is heated to 100-250 degreesC to convert the precursor to a polycyclic aromatic compound.

The polycyclic aromatic compound are segmented by screen printing, microcontact printing or blanket film patterning to reduce leakage and stray currents in the thin film transistor device.

Preferred Material: The substrate includes glass, quartz, metals, highly doped silicon, or undoped silicon.

POLYMERS - Preferred Material: The substrate can be plastic consisting of Mylar(TM), polycarbonate, or polyimide.

The gate electrode can be made from conductive polyaniline, polythiophene, or polypyrrole.

METALLURGY - Preferred Material: The gate electrode is made of chromium, titanium, aluminum, copper, gold, platinum, or palladium.

#### EXTENSION ABSTRACT:

EXAMPLE - Pentacene (834 mg) and methyl rhenium trioxide (50) were added to a solution of dimethylazodicarboxylate (1.05 g) and 40 ml anhydrous chloroform. The mixture was refluxed for 18 hours to dissolved pentacene and provided a yellow clear solution. The solvent was evaporated and residue was flash chromatographed on a column of silica gel first eluting with 9:1 hexane ethyl acetate to remove excess dimethylazodicarboxylate and then elution with 50:50 hexane ethyl acetate gave 1.65 g 90% yield of a Diels-Alder adduct of pentacene and dimethylazodicarboxylate as white powder.

FILE SEGMENT: CPI; EPI  
 MANUAL CODE: CPI: A11-B05C; A11-B05D; A11-C04; A12-E07C;  
 E05-E01; E05-G02; E06-H; E07-B01; E08-H; E10-A03C;  
 E10-A09C; E10-A11A2; E10-A11B2; E10-A12C2;  
 E10-A13B2; E10-A16B; E10-A18B; E10-A20B; E10-D01D;  
 E10-F01; E10-F02; E10-G01; E10-G02; L04-A04C;  
 L04-A04D; L04-E01E  
 EPI: U11-A01F; U11-C18A1; U12-B03A; U12-B03C

L30 ANSWER 9 OF 11 WPIX COPYRIGHT 2010 THOMSON REUTERS on STN  
 ACCESSION NUMBER: 2003-504993 [200347] WPIX  
 CROSS REFERENCE: 2007-269881  
 DOC. NO. CPI: C2003-134857 [200347]  
 TITLE: Decomposable thin film useful for e.g. generating a  
 three dimensional microstructure or controlled  
 release of an associated entity comprises several  
 polyelectrolyte layers of alternating charge  
 A18; A28; A96; B04; B07; D16; G08; P73  
 DERWENT CLASS: HAMMOND P; HAMMOND P T; LANGER R; LANGER R S; LYNN  
 INVENTOR: D M; VAZQUEZ E  
 PATENT ASSIGNEE: (HAMM-I) HAMMOND P T; (LANG-I) LANGER R; (LYNN-I)  
 LYNN D M; (MASI-C) MASSACHUSETTS INST TECHNOLOGY;  
 (VAZQ-I) VAZQUEZ E  
 COUNTRY COUNT: 98  
 PATENT INFORMATION:

PATENT NO	KIND DATE	WEEK	LA	PG	MAIN IPC
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WO 2003035716 A1 20030501 (200347)* EN 33[17]
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US 20030124368 A1 20030703 (200351) EN
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AU 2002353881 A1 20030506 (200461) EN
<---
US 7112361 B2 20060926 (200663) EN
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## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2003035716 A1		WO 2002-US34191	
20021025			
US 20030124368 A1	Provisional	US 2001-335213P	
20011025			
US 20030124368 A1		US 2002-280268	
20021024			
AU 2002353881 A1		AU 2002-353881	
20021025			
US 7112361 B2	Provisional	US 2001-335213P	
20011025			
US 7112361 B2		US 2002-280268	
20021024			

## FILING DETAILS:

PATENT NO	KIND	PATENT NO
AU 2002353881 A1	Based on	WO 2003035716 A

PRIORITY APPLN. INFO: US 2001-335213P 20011025  
 US 2002-280268 20021024

## INT. PATENT CLASSIF.:

MAIN: C08G063-685  
 SECONDARY: C08B037-00; C08G059-42; C08G063-695; C08G075-02;  
 C08G075-20; C08G077-00; C08J005-22; C09D167-06;  
 C09D005-44; C30B033-00; H01B013-00; H01B013-06;  
 H01B013-16

IPC ORIGINAL: B32B0007-02 [I,A]; B32B0007-02 [I,C]  
 IPC RECLASSIF.: A61K0009-50 [I,A]; A61K0009-50 [I,C]; B01J0013-02  
 [I,A]; B01J0013-02 [I,C]; B01J0013-20 [I,C];  
 B01J0013-22 [I,A]; C08F0002-46 [I,A]; C08F0002-46  
 [I,C]; C08F0283-00 [I,A]; C08F0283-00 [I,C];  
 C08F0283-01 [I,A]; C08F0283-02 [I,A]; C08F0287-00  
 [I,A]; C08F0287-00 [I,C]; C08F0291-00 [I,A];  
 C08F0291-00 [I,C]; C08J0005-20 [I,A]; C08J0005-20  
 [I,C]; C08L0051-00 [I,A]; C08L0051-00 [I,C];  
 C08L0051-08 [I,A]; C08L0053-00 [I,A]; C08L0053-00  
 [I,C]; C08L0073-00 [I,C]; C08L0073-02 [I,A];  
 C08L0085-00 [I,C]; C08L0085-02 [I,A]; C09D0151-00  
 [I,A]; C09D0151-00 [I,C]; C09D0151-08 [I,A];  
 C09D0151-08 [I,C]; C09D0153-00 [I,A]; C09D0153-00  
 [I,C]

ECLA: A61K0009-50H6B; A61K0009-50K; A61K0009-50P;  
 B01J0013-02; B01J0013-22; C08F0283-00; C08F0283-01;  
 C08F0283-02; C08F0287-00; C08F0291-00; C08J0005-20;  
 C08L0051-00C+B; C08L0051-08+B; C08L0053-00+B;

C08L0073-02+B; C08L0085-02+B; C09D0151-00C+B;  
C09D0151-08+B; C09D0153-00+B

USCLASS NCLM: 428/212.000  
NCLS: 428/402.000; 428/402.200; 428/402.210; 428/402.220;  
428/402.240; 428/403.000; 428/426.000; 428/446.000;  
428/454.000; 428/457.000; 428/480.000; 428/483.000;  
428/702.000

# BASIC ABSTRACT:

WO 2003035716 A1 UPAB: 20050903

NOVELTY - Decomposable thin film (F) comprises several polyelectrolyte layers of alternating charge. The decomposition of the thin film is caused by degradation of at least a portion of the polyelectrolyte layers.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(1) releasing (M1) an entity from a thin film involving associating the entity with (F); and placing (F) in a medium in which at least a portion decomposes via the substantially sequential degradation of at least a portion of the polyelectrolyte layers; and

(2) generating (M2) a three dimensional microstructure on a substrate surface involving creating a charged region on the substrate surface; depositing several polyelectrolyte layers of alternating charge on the charged region; depositing a first non-degradable material over the substrate and the several polyelectrolyte layers; and placing the coated substrate in a medium in which at least a portion of the polyelectrolyte layers degrade.

USE - (P) is useful for generating a three dimensional microstructure on a substrate surface (claimed) and for gradual and controlled release of entities from thin films. The entities include the structural polyelectrolyte components of (P) including DNA and proteins or other non-structural entities, such as biomolecules, small molecules or bioactive agents. The rate at which the entity is released can be measured. (P) can be used to create a degradable substrate for cell seeding and culture. Electroactive polymers may be used as conductive polymers may enhance the proliferation of cells deposited upon them. The thin film can regulate diffusion into the surrounding medium. TECHNOLOGY FOCUS:

POLYMERS - Preferred Components: The thin film comprises alternating polycationic and polyanionic layers. The decomposition of the film is caused by hydrolytic degradation of a member of the polycationic layers and/or the polyanionic layers. A portion of the polyelectrolyte layers comprises a member of synthetic and/or natural polyelectrolyte or polyester, polyanhydride, polyorthoester, polyphosphazene and/or polyphosphoester. The polyester is poly(beta-amino ester)s (preferably of formula (I), (II) or (III)), poly(L-lactide-co-L-lysine), poly(serine ester), poly(4-hydroxy-L-proline ester) and/or poly(alpha-(4-aminobutyl)-L-glycolic acid). At least a portion of the polymer comprises a member of an anionic group and/or a cationic group (preferably a carboxylate, sulfonate, sulfate, phosphate, nitrate, protonated amine, quaternary ammonium or phosphonium group) which is incorporated in the backbone of the polymer, covalently attached to the backbone of the polymer, or covalently attached to a pendant group of the polymer. At least a portion of the polyelectrolyte layer comprises a polymer selected from poly(styrene sulfonate), poly(acrylic acid), linear poly(ethylene imine), poly(diallyl dimethyl ammonium chloride) and/or poly(allylamine hydrochloride) or a biodegradable polymer (preferably polyhydroxyacid, polypropylfumerate, polycaprolactone, polyamide, poly(amino acid), polyacetal, polyether, biodegradable polycyanoacrylate, biodegradable polyurethane, polysaccharide, copolymer and/or their adduct), thermally degradable polymer, photolytically degradable polymer, electroactive polymer or zwitterionic polymer (preferably alternating layers of a first zwitterionic polymer and a second zwitterionic polymer where the



first polymer is a polycation and the second polymer is a polyanion at a selected non-physiological pH and the first polymer is a polyanion and the second polymer is a polycation at a physiological pH).

**Preferred Film:** The degradation rate of the layers varies such that the decomposition rate of the thin film is not a constant. The thin film is deposited on a non-planar substrate (preferably a drug) having a shape of particles, tube, sphere, strand, coiled strand, or capillary network. The degradation of the thin film enables dissolution of the substrate material. The thin film is adapted and constructed as a hollow shell. The substrate material diffuses through the thin film when the thin film-substrate combination is placed in a pre-selected medium. The film is disposed on a substrate where surface properties of the substrate vary across a surface of the substrate. The substrate is a metal, metal oxide, plastic, ceramic, silicon, glass, mica, graphite, hydrogel and/or polymer and a primer layer is interposed between the thin film and the substrate. The primer layer comprises a polyelectrolyte bilayer (preferably poly(styrene sulfonate), poly(acrylic acid), linear poly(ethylene imine), poly(diallyl dimethyl ammonium chloride), or poly(allylamine hydrochloride)).

**Preferred Method (M1):** The degradation involves at least one of hydrolytic, thermal, enzymatic or photolytic. (M1) involves depositing alternating polyanionic and polycationic layers on a substrate. The step of associating involves associating the entity with at least a portion of a member of the polycationic and polyanionic layers. (M1) involves depositing the thin film on a substrate; diffusing the substrate material through the thin film; and dissolving the substrate. It also comprises preparing a substrate (by charging the surface and/or depositing a primer layer (consisting of at least one polyelectrolyte bilayer) on the substrate) and depositing the polyelectrolyte layers on the substrate. The step of charging the surface of the substrate involves depositing a self-assembled monolayer on the substrate surface, depositing a uniform coating of a polymer on the substrate surface and patterning the uniform coating by photolithography, selectively exposing the substrate surface to plasmas, selectively exposing the substrate surface to electromagnetic radiation and/or selectively exposing the substrate surface to electron beams. The entity is cells deposited on a surface of the film. A second entity is also associated with the film. The entity is not released at a constant rate. The film is deposited on the substrate by layer-by-layer deposition. The layers are deposited by dip, spray, brush and/or roll coating and/or spin casting. The film is placed in a second medium in which a second portion of the film decomposes. The medium has endosomal conditions and physiological conditions.

**Preferred Method (M2):** In (M2), the step of creating a charged region involves either depositing a self-assembled monolayer; depositing a uniform coating of a polymer on the substrate surface and patterning the uniform coating by photolithography; selectively exposing the substrate surface to a member from

plasmas, electromagnetic radiation and/or electron beams; or depositing a self-assembled monolayer . (M2) further involves creating a charged region on the first non-degradable material; depositing several polyelectrolyte layers of alternating charge on the charged region; and depositing a second non-degradable material over the first non-degradable material and the layers. The second non-degradable material is same as the first non-degradable material. A surface composition of a first portion of the substrate is not the same as the surface composition of a second portion of the substrate.

A, B = 1-30C atoms, heteroatom-containing 1-30C atoms, and carbon chains and heteroatom-containing carbon chains (optionally with at least one substituent selected from alkyl, alkenyl, alkynyl, amino, alkylamino, dialkylamino, trialkylamino, aryl, ureido, heterocyclic, aromatic heterocyclic, cyclic, aromatic cyclic, halogen, hydroxyl, alkoxy, cyano, amide, carbamoyl, carboxylic acid, ester, carbonyl, carbonyldioxy, alkylthioether or thiol);

R1, R2 = alkyl, alkenyl or alkynyl), H, aryl, halogen, hydroxyl, alkoxy, carbamoyl, carboxyl ester, carbonyldioxy, amide, thiohydroxyl, alkylthioether, amino, alkylamino, dialkylamino, trialkylamino, cyano, ureido, a substituted alkanoyl group, cyclic, aromatic, heterocyclic or aromatic heterocyclic groups (optionally substituted by at least one of alkyl, alkenyl, alkynyl, amino, alkylamino, dialkylamino, trialkylamino, aryl, ureido, heterocyclic, aromatic heterocyclic, cyclic, aromatic cyclic, halogen, hydroxyl, alkoxy, cyano, amide, carbamoyl, carboxylic acid, ester, carbonyl, carbonyldioxy, alkylthioether or thiol); and  
n = 5-10000.

BIOLOGY - Preferred Components: The film further comprises a layer of cells deposited on the surface of the thin film. The cells are connective tissue cells, organ cells, muscle cells, nerve cells, stem cells and/or cancer cells. At least a portion of the layers comprises an entity selected from biomolecule, small molecule (preferably drug) and/or bioactive agent. A second portion of the layers comprise second entity selected from biomolecule, small molecule and/or bioactive agent. The concentration of the entity in the thin film varies with depth. The entity is associated with a polyelectrolyte in a layer of the thin film via an interaction selected from covalent bond, a hydrogen bond, an electrostatic interaction, a Van der Waals interaction, a hydrophobic interaction and/or a magnetic interaction or it is mixed with a polyelectrolyte in a layer of the thin film. The film further comprises member of cell adhesion sequence, targeting sequence, and both disposed in a top layer of the thin film.

#### EXTENSION ABSTRACT:

EXAMPLE - Silicon substrates were rinsed with ethanol and acetone, dried using nitrogen and plasma etched to remove organic materials and charge the surface. 10 precursor bilayers of linear poly(ethylene imine)/poly(sodium 4-styrenesulfonate) (SPS) were deposited, terminating with the anion monolayer. Then 10 bilayers of a poly(beta-amino ester)/(SPS) were deposited.

FILE SEGMENT:

CPI; GMPI

MANUAL CODE:

CPI: A12-M02; B04-C03; B04-E01; B04-F01; B04-N04;  
B11-C08; B12-K04; B12-M10; D05-H10; G06-G05

L30 ANSWER 10 OF 11 WPX COPYRIGHT 2010 THOMSON REUTERS ON STN  
ACCESSION NUMBER: 2003-430073 [200340] WPX

TITLE: High resolution patterning used in fabricating highly-integrated biochips, by forming aromatic imine monolayer on substrate, selectively removing substituents from monolayer, and hydrolyzing aromatic imine monolayer

DERIVATIVE CLASS: A13; A89; B04; D16; E14; G06; L03; P84; S03; U11; U13

INVENTOR: KANG T; KANG T H; KIM B; KIM B S; KIM G J; KIM K; KIM K J; LA Y; LA Y H; LA YOUNG H; MOON J H; MUN J H; NA Y H; NAH Y H; PARK J W

PATENT ASSIGNEE: (KANG-I) KANG T H; (KIMB-I) KIM B; (KIMK-I) KIM K J; (LYOU-I) LA YOUNG H; (MOON-I) MOON J H; (PARK-I) PARK J W; (UYPO-C) POSTECH ACAD-IND FOUND; (UYPO-C) POSTECH FOUND; (UYPO-C) UNIV POHANG SCI&TECHNOLOGY 100

COUNTRY COUNT: 100

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2003023517	A1	20030320	(200340)*	EN	33	[7]
KR 2003023191	A	20030319	(200350)	KO		
EP 1428074	A1	20040616	(200439)	EN		
AU 2002362244	A1	20030324	(200461)	EN		
US 20040241590	A1	20041202	(200481)	EN		
JP 2005502916	W	20050127	(200510)	JA	57	
KR 473799	B	20050307	(200545)	KO		
US 7267932	B2	20070911	(200761)	EN		
JP 4032104	B2	20080116	(200808)	JA	21	
US 20080038542	A1	20080214	(200813)	EN		

## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2003023517 A1		WO 2002-KR1714	
20020912			
KR 2003023191 A		KR 2001-56221	20010912
KR 473799 B		KR 2001-56221	20010912
AU 2002362244 A1		AU 2002-362244	
20020912			
EP 1428074 A1		EP 2002-798054	
20020912			
EP 1428074 A1		WO 2002-KR1714	
20020912			
US 20040241590 A1		WO 2002-KR1714	
20020912			
JP 2005502916 W		WO 2002-KR1714	
20020912			
US 7267932 B2		WO 2002-KR1714	
20020912			
JP 4032104 B2		WO 2002-KR1714	

20020912		
JP 2005502916 W		JP 2003-527514
20020912		
JP 4032104 B2		JP 2003-527514
20020912		
US 20040241590 A1		US 2004-489411
20040312		
US 7267932 B2		US 2004-489411
20040312		
US 20080038542 A1 Cont of		WO 2002-KR1714
20020912		
US 20080038542 A1 Cont of		US 2004-489411
20040312		
US 20080038542 A1		US 2007-717191 20070313

## FILING DETAILS:

PATENT NO	KIND		PATENT NO	
JP 4032104	B2	Previous Publ	JP 2005502916	W
KR 473799	B	Previous Publ	KR 2003023191	A
EP 1428074	A1	Based on	WO 2003023517	A
AU 2002362244	A1	Based on	WO 2003023517	A
JP 2005502916	W	Based on	WO 2003023517	A
US 7267932	B2	Based on	WO 2003023517	A
JP 4032104	B2	Based on	WO 2003023517	A
US 20080038542	A1	Cont of	US 7267932	B

PRIORITY APPLN. INFO: KR 2001-56221 20010912

## INT. PATENT CLASSIF.:

MAIN: G03F0007-00

IPC ORIGINAL: B32B0005-16 [I,A]; B32B0005-16 [I,C]; G01N0033-00 [I,A]; G01N0033-00 [I,C]; G03C0005-00 [I,A]; G03C0005-00 [I,C]; G03F0007-00 [I,A]; G03F0007-00 [I,C]; G03F0007-004 [I,A]; G03F0007-004 [I,C]; G03F0007-075 [I,A]; G03F0007-075 [I,C]; G03F0007-16 [I,A]; G03F0007-16 [I,C]; H01L0021-02 [I,C]; H01L0021-027 [I,A]; H01L0021-302 [I,A]

IPC RECLASSIF.: G03F0007-004 [I,A]; G03F0007-004 [I,C]; G03F0007-075 [I,A]; G03F0007-075 [I,C]; G03F0007-16 [I,A]; G03F0007-16 [I,C]; G03F0007-20 [I,A]; G03F0007-20 [I,C]; H01L0021-02 [I,C]; H01L0021-027 [I,A]; H01L0021-033 [I,A]

ECLA: B81C0001-00F2D4M2; G03F0007-004D; G03F0007-075F; G03F0007-16L; G03F0007-20D2; H01L0021-033F4; H01L0021-312

ICO: L81B0201:02B; L81C0201:01H6; Y01N0004:00

USCLASS NCLM: 428/333.000; 430/322.000

NCLS: 257/E21.038; 257/E21.259; 430/311.000; 430/967.000; 438/689.000

## JAP. PATENT CLASSIF.:

MAIN/SEC.: G03F0007-004 521; G03F0007-075 511; H01L0021-30 502 R

MAIN: G03F0007-075 511

SECONDARY: G03F0007-004 521; H01L0021-30 502 R

FTERM CLASSIF.: 2H025; 2H125; 5F046; 2H025/AA02; 2H025/AB16; 2H025/AB20; 2H025/AC05; 2H025/AD03; 2H025/BF30; 2H025/BG00; 2H025/BJ10

## BASIC ABSTRACT:

WO 2003023517 A1 UPAB: 20090811

NOVELTY - High resolution patterning of self-assembled monolayer includes forming an aromatic imine monolayer having substituted terminal ring on a substrate; selectively removing the substituents from the aromatic imine monolayer; and hydrolyzing the aromatic imine monolayer.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(a) a substrate comprising a base plate, and a surface layer comprising hydrophilic amine monolayer in a region and hydrophobic aromatic imine monolayer in the other region forming a nano-scale pattern together; (b) a method of manufacturing a semiconductor device by coating the substrate with a diblock copolymer (preferably polystyrene-block-methylmethacrylate), and thermally processing (annealing) and etching the coated substrate; and (c) a biochip comprising the substrate, and biomolecules (e.g. proteins, DNA, or RNA) bound to amine groups of hydrophilic amine monolayer.

USE - The inventive method is used for high resolution patterning of self-assembled monolayer. The substrate comprising high resolution pattern is useful as a base substrate in semiconductor material field. The method can be used in the development of highly-integrated biochips or miniaturized biosensors.

ADVANTAGE - A desired nano-scale high resolution pattern having alternate hydrophilic and hydrophobic regions can be formed on a substrate surface within a short time. Due to the reactive hydrophilic amine groups in the pattern, binding with enzymes or various functional substances can be controlled on nano-scale.

TECHNOLOGY FOCUS:

ELECTRONICS - Preferred Method: Formation of aromatic imine monolayer on substrate includes forming a self-assembled aminosilylated or aminothiolated monolayers on the substrate, and processing the surface of self-assembled monolayers with an aromatic aldehyde having a substituted terminal ring. Selective removal of substituents from aromatic imine monolayer includes exposing the substrate to soft X-rays through a photomask (preferably a zone mask) placed on the substrate.

Preferred Parameter: The soft X-rays have a wavelength of 0.3-30 nm at 40 - 1500 eV.

INORGANIC CHEMISTRY - Preferred Material: The substrate is made of silica or gold.

ORGANIC CHEMISTRY - Preferred Components: The aromatic aldehyde is a non-conjugated aromatic aldehyde of formula (I) or a conjugated aromatic aldehyde of formulae (II)-(IV).

X = NO<sub>2</sub>, F, Cl, Br, or I

FILE SEGMENT:

CPI; GMP1; EPI

MANUAL CODE:

CPI: A12-E07C; A12-L02B2; B04-C03; B04-E01;  
B04-N04; B05-A03B; B05-B02C; B10-D01; B11-C08E6;  
D05-H09; D05-H12; E10-D01D; E31-F03; E35-B;  
G06-D06; G06-F03C; L04-C06  
EPI: S03-E14H; S03-E15; U11-C18C; U13-D04

L30 ANSWER 11 OF 11

WPIX COPYRIGHT 2010 THOMSON REUTERS on STN

ACCESSION NUMBER:

2003-255528 [200325] WPIX

DOC. NO. CPI:

C2003-066124 [200325]

DOC. NO. NON-CPI:

N2003-202686 [200325]

TITLE:

Metallization of substrate involves depositing passivation layer, directly on substrate surface

DERWENT CLASS:

E19; L03; M13; P73; U11

INVENTOR:

LU T; SENKEVICH J J; YANG G

PATENT ASSIGNEE:

(RENS-N) RENSSSLAER POLYTECHNIC INST

COUNTRY COUNT:

1

## PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20020182385	A1	20021205	(200325)*	EN	26	[17]

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## APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20020182385	A1	Provisional	US 2001-293950P
20010529			
US 20020182385	A1		US 2002-157210
20020529			

PRIORITY APPLN. INFO: US 2002-157210 20020529  
US 2001-293950P 20010529

## INT. PATENT CLASSIF.:

IPC RECLASSIF.: C23C0016-02 [I,A]; C23C0016-02 [I,C]; H05K0003-38 [I,A]; H05K0003-38 [I,C];  
ECLA: C23C0016-02H; H05K0003-38  
ICO: L82T0201:01T; Y01N0006:00  
USCLASS NCLM: 428/209.000  
NCLS: 174/259.000

## BASIC ABSTRACT:

US 20020182385 A1 UPAB: 20050528

NOVELTY - A substrate is metallized by depositing an atomic passivation layer directly on a substrate surface.

DETAILED DESCRIPTION - Metallization of substrate involves:

(1) providing, in vapor form, a precursor for an element from sulfur, selenium, tellurium, phosphorus, antimony, iodine or bromine;

(2) (ii) depositing, directly on a substrate surface, an atomic passivation layer comprising the element; and

(3) forming, directly on the atomic passivation layer, a metallic layer comprising a metallic element from zinc, copper, nickel, cobalt, iron, antimony, tin, indium, cadmium, silver, palladium, rhodium, rubidium, bismuth, lead, thallium, mercury, gold, platinum, iridium, osmium, rhenium, tungsten, tantalum, hafnium, neodymium, samarium, europium or gadolinium. An INDEPENDENT CLAIM is also included for a metallized barrier layer comprising a diffusion barrier layer; and a passivation layer disposed directly on a surface of the diffusion layer and comprising a silyl-anchored self-assembled monolayer or self-assembled multilayer, terminated with an element.

USE - For metallizing a substrate (claimed).

ADVANTAGE - The invention allows the deposition of high quality metal thin films. It also allows the wetting of metals on dielectric and diffusion barrier materials. DESCRIPTION OF DRAWINGS - The figure illustrates the relationship between metal thin, dielectric, and self-assembled monolayer.

## TECHNOLOGY FOCUS:

ELECTRONICS - Preferred Components: The substrate comprises a dielectric material and a diffusion barrier layer.

Preferred Method: The deposition of the atomic passivation layer is plasma-enhanced, thermally-assisted or photo-assisted. The metallic layer is formed by a process from chemical vapor deposition, electrochemical deposition, atomic layer deposition or chemical fluid deposition. It is deposited from a metal source precursor(s) comprising a metal-beta-diketonate.

CERAMICS AND GLASS - Preferred Material: The

substrate is ceramic materials having an oxide surface, organic polymers or organic/inorganic hybrid materials.

INORGANIC CHEMISTRY - Preferred Components: The substrate comprises silicon having a silicon oxide surface. The atomic passivation layer comprises sulfur (preferably) or phosphorus. It is derived from an alkoxy or chlorosilane comprising an element from S

ORGANIC CHEMISTRY - Preferred Components: The precursor is hydrogen sulfide (preferably), R<sub>2</sub>S, H<sub>2</sub>Se, H<sub>2</sub>Te, SbH<sub>3</sub>, phosphine (preferably), hydrogen iodide, iodine gas, RI or bromine gas.

R = alkyl or aryl.

The metal source precursor can be Pd(hfac)<sub>2</sub>, Cu(hfac) or Cu(tmhd)<sub>2</sub>. The passivation layer is derived from an alkoxy or chlorosilane.

```
FILE SEGMENT:      CPI; GMPI; EPI
MANUAL CODE:       CPI: E05-A; E05-D; E05-E01; E05-E02; E05-E03;
                   E05-F; E05-J; E05-L02; E05-L03B; E05-L03D; E05-M;
                   E05-N; E05-P; E10-H01B; E31-B03A; E31-B03C;
                   E31-F04; E31-G; E31-K07; E31-M; L04-C01A; L04-C10;
                   M13-F03
                   EPI: U11-C05B9A; U11-C05C3; U11-C05D3; U11-D03B2
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FILE COVERS 1907 - 22 Jul 2010 VOL 153 ISS 4
FILE LAST UPDATED: 21 Jul 2010 (20100721/ED)
REVISED CLASS FIELDS (/NCL) LAST RELOADED: Apr 2010
USPTO MANUAL OF CLASSIFICATIONS THESAURUS ISSUE DATE: Apr 2010
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HCAplus now includes complete International Patent Classification (IPC) reclassification data for the second quarter of 2010.

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This file contains CAS Registry Numbers for easy and accurate substance identification.

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FILE 'JAPIO' ENTERED AT 15:50:14 ON 22 JUL 2010
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FILE LAST UPDATED: 6 JUL 2010 <20100706/UP>  
 MOST RECENT PUBLICATION DATE: 25 MAR 2010 <20100325/PD>  
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 FILE COVERS 1970 TO DATE.

<<< SIMULTANEOUS LEFT AND RIGHT TRUNCATION IS AVAILABLE IN  
 THE BASIC INDEX (/BI), ABSTRACT (/AB), and TITLE (/TI) FIELDS >>>

=> d que 137

L3 19833 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON SELF(W)ASSEMBL?(  
 W) (MONOLAYER? OR MONO(W)LAYER?)  
 L4 QUE SPE=ON ABB=ON PLU=ON SURFACE  
 L5 QUE SPE=ON ABB=ON PLU=ON SUBSTRATE  
 L6 QUE SPE=ON ABB=ON PLU=ON ARTICLE OR WORKPIECE OR WORK  
 (W)PIECE  
 L7 8194 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON (L3 OR L4) AND  
 (L5 OR L6)  
 L8 7201 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON L7 AND L3  
 L9 QUE SPE=ON ABB=ON PLU=ON SURFACE  
 L10 5899 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON L7 AND L9  
 L11 5600 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON L10 AND L8  
 L12 QUE SPE=ON ABB=ON PLU=ON THERMAL?  
 L13 280 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON L11 AND L12  
 L14 QUE SPE=ON ABB=ON PLU=ON ARYL OR AROMATIC?  
 L15 QUE SPE=ON ABB=ON PLU=ON ALICYCLIC?  
 L16 205 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON L11 AND (L14 OR  
 L15)  
 L17 11 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON L13 AND L16  
 L21 6 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON L17 AND  
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 L23 939 SEA FILE=WPIX SPE=ON ABB=ON PLU=ON (L3 OR L4) AND (L5  
 OR L6)  
 L24 660 SEA FILE=WPIX SPE=ON ABB=ON PLU=ON L23 AND L9  
 L31 1 SEA FILE=JAPIO SPE=ON ABB=ON PLU=ON L24 AND (L14 OR  
 L15)  
 L32 91 SEA FILE=COMPENDEX SPE=ON ABB=ON PLU=ON L24 AND (L14  
 OR L15)  
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 L34 6 SEA FILE=COMPENDEX SPE=ON ABB=ON PLU=ON L33 AND  
 PY<=2006  
 L35 14 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON (WO2002-KR1714/A  
 L36 5 SEA FILE=HCAPLUS SPE=ON ABB=ON PLU=ON L21 NOT L35  
 L37 11 DUP REM L36 L31 L34 (1 DUPLICATE REMOVED)



=&gt; d 137 iall 1-11

L37 ANSWER 1 OF 11 COMPENDEX COPYRIGHT 2010 EEI on STN  
 ACCESSION NUMBER: 2005-189074234 COMPENDEX [Full-text](#)  
 TITLE: Mapping molecular orientation of pentacene on patterned Au surface  
 AUTHOR(S): Hsu Y.J.; Wei D.H.; Wu Y.S.; Hu W.S.; Tao Y.T.  
 CORPORATE SOURCE: Hsu Y.J.; Wei D.H.; Wu Y.S. (Nat'l. Synchrotron Radiat. Res. Center, Hsinchu, 30076 (TW)); Hu W.S. (Department of Chemistry, National Tsing-Hua University, Hsinchu (TW)); Tao Y.T. (Institute of Chemistry, Academia Sinica, Taipei, 115 (TW))  
 EMAIL: yjhsu@nsrc.org.tw; ytt@chem.sinica.edu.tw  
 SOURCE: Journal of Electron Spectroscopy and Related Phenomena (Jun 2005) Volume 144-147, pp. 401-404, 12 refs.  
 CODEN: JESRAW ISSN: 0368-2048  
 DOI: 10.1016/j.elspec.2005.01.244  
 Published by: Elsevier  
 PUBL. ITEM IDENTIFIER: S0368204805001143  
 COUNTRY OF PUBLICATION: Netherlands  
 DOCUMENT TYPE: Journal; (Conference Paper); Theoretical  
 LANGUAGE: English  
 SUMMARY LANGUAGE: English  
 ENTRY DATE: Entered STN: 4 Jan 2009  
 Last updated on STN: 4 Jan 2009  
 ABSTRACT: With a photoemission electron microscope, we investigated the orientation of pentacene films deposited on Au surface that has been patterned with self-assembled monolayers (SAMs). Organic thiols  $X(CH_2)_nSH$  with  $X = COOH$  or  $CH_3$  and an aromatic thiol; served as alignment layers to control the orientation of pentacene molecules thermally deposited on top of the SAM. According to the PEEM images and near-edge X-ray absorption fine structure spectra, a SAM exposing a non-polar methyl group, a terphenyl group or a polar carboxyl group all induced perpendicular alignment of the pentacene moiety, in contrast with parallel alignment on a bare gold surface.  
 CLASSIFICATION CODE: .COPYRGT. 2005 Elsevier B.V. All rights reserved.  
 931.3 Atomic and Molecular Physics; 931.2 Physical Properties of Gases, Liquids and Solids; 801 Chemistry; 933.1.1 Crystal Lattice; 741.3 Optical Devices and Systems; 714.2 Semiconductor Devices and Integrated Circuits; 547.1 Precious Metals; 741.1 Light and Optics  
 CONTROLLED TERM: \*Crystal orientation; Anisotropy; Gold; Light emission; Microscopic examination; Self assembly; Substrates; Thin films; X ray analysis  
 SUPPLEMENTARY TERM: Micro-near-edge X ray absorption fine structure spectra (NEXAFS); PEEM; Pentacene; SAMs  
 ELEMENT TERMS: Au; Au; C\*H\*O; COOH; C cp; cp; O cp; H cp  
 L37 ANSWER 2 OF 11 HCAPLUS COPYRIGHT 2010 ACS on STN  
 ACCESSION NUMBER: 2005:1037242 HCAPLUS [Full-text](#)  
 DOCUMENT NUMBER: 143:468270  
 ENTRY DATE: Entered STN: 28 Sep 2005  
 TITLE: Characterization of self-assembled thin films of zirconium phosphonate/aromatic diimides  
 AUTHOR(S): Marcon, Rodrigo O.; Brochsztain, Sergio  
 CORPORATE SOURCE: Centro Interdisciplinar de Investigacao Bioquimica, Universidade de Mogi das Cruzes, Mogi das Cruzes, 08780-911, Brazil  
 SOURCE: Thin Solid Films (2005), 492(1-2),

30-34  
 CODEN: THSFAP; ISSN: 0040-6090  
 PUBLISHER: Elsevier B.V.  
 DOCUMENT TYPE: Journal  
 LANGUAGE: English  
 CLASSIFICATION: 73-4 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)  
 Section cross-reference(s): 29, 66  
 CASREACT 143:468270

## OTHER SOURCE(S):

## ABSTRACT:

The synthesis of three novel phosphonate-substituted aromatic diimides is described: N,N'-bis(2-phosphonoethyl)pyromellitimide (PPMI), N,N'-bis(2-phosphonoethyl)-1,4,5,8-naphthalenediimide (PNDI) and N,N'-bis(2-phosphonoethyl)-3,4,9,10-perylenediimide (PPDI). The imides are water-soluble, allowing spectroscopical studies to be performed in water. PPMI and PNDI exist in the monomeric form in water, but PPDI formed dimers. Self-assembled thin films of the three compds. were grown on phosphonate-primed silicon and quartz substrates by the zirconium phosphonate method. Film growth was followed by ellipsometry (silicon) and UV/visible absorption spectroscopy (quartz). The films obtained were highly thermally and solvolytically stable for all the three imides, making them excellent candidates for applications in nanotechnol. devices.

SUPPL. TERM: self assembled thin film zirconium phosphonate  
 arom diimide  
 INDEX TERM: Self-assembled monolayers  
 (characterization of self-assembled thin films of  
 zirconium phosphonate/aromatic diimides)  
 INDEX TERM: Imides  
 ROLE: PEP (Physical, engineering or chemical process);  
 PRP (Properties); PYP (Physical process); SPN  
 (Synthetic preparation); PREP (Preparation); PROC  
 (Process)  
 (diimides; characterization of self-assembled thin  
 films of zirconium phosphonate/aromatic  
 diimides)  
 INDEX TERM: Aggregation  
 (dye aggregation in water; characterization of  
 self-assembled thin films of zirconium phosphonate/  
 aromatic diimides)  
 INDEX TERM: Molar absorptivity  
 (increases with diimide ring size; characterization  
 of self-assembled thin films of zirconium  
 phosphonate/aromatic diimides)  
 INDEX TERM: UV and visible spectra  
 (of diimides in solution and film; characterization of  
 self-assembled thin films of zirconium phosphonate/  
 aromatic diimides)  
 INDEX TERM: 243126-11-6P, N,N'-Bis(2-phosphonoethyl)-1,4,5,8-  
 naphthalenediimide 869371-05-1P,  
 N,N'-Bis(2-phosphonoethyl)pyromellitimide  
 869371-15-3P, N,N'-Bis(2-phosphonoethyl)-3,4,9,10-  
 perylenediimide  
 ROLE: PEP (Physical, engineering or chemical process);  
 PRP (Properties); PYP (Physical process); SPN  
 (Synthetic preparation); PREP (Preparation); PROC  
 (Process)  
 (characterization of self-assembled thin films of  
 zirconium phosphonate/aromatic diimides)

INDEX TERM: 869371-10-8P 869371-26-6P  
 ROLE: SPN (Synthetic preparation); PREP (Preparation)  
 (characterization of self-assembled thin films of  
 zirconium phosphonate/aromatic diimides)

INDEX TERM: 2041-14-7, 2-Aminoethylphosphonic acid  
 ROLE: RCT (Reactant); RACT (Reactant or reagent)  
 (imidation reactions; characterization of  
 self-assembled thin films of zirconium phosphonate/  
 aromatic diimides)

INDEX TERM: 81-30-1, 1,4,5,8-Naphthalenetetracarboxylic  
 dianhydride 89-32-7, Pyromellitic dianhydride  
 128-69-8, 3,4,9,10-Perylenetetracarboxylic dianhydride  
 ROLE: RCT (Reactant); RACT (Reactant or reagent)  
 (imidation; characterization of self-assembled thin  
 films of zirconium phosphonate/aromatic  
 diimides)

INDEX TERM: 869371-16-4P  
 ROLE: RCT (Reactant); SPN (Synthetic preparation);  
 PREP (Preparation); RACT (Reactant or reagent)  
 (saponification; characterization of self-assembled thin  
 films of zirconium phosphonate/aromatic  
 diimides)

INDEX TERM: 7440-21-3D, Silicon, successive surface  
 modifications with aminopropyl, phosphonate, and  
 zirconate groups 14808-60-7D, Quartz, successive  
 surface modifications with aminopropyl,  
 phosphonate, and zirconate groups, uses  
 ROLE: NUU (Other use, unclassified); USES (Uses)  
 (substrate; characterization of  
 self-assembled thin films of zirconium phosphonate/  
 aromatic diimides)

INDEX TERM: 10025-87-3, Phosphoryl chloride  
 ROLE: RCT (Reactant); RACT (Reactant or reagent)  
 (surface reaction with aminopropylated  
 silicon and quartz for generating surface  
 phosphonate groups; characterization of  
 self-assembled thin films of zirconium phosphonate/  
 aromatic diimides)

INDEX TERM: 919-30-2, 3-(Aminopropyl)triethoxysilane  
 ROLE: RCT (Reactant); RACT (Reactant or reagent)  
 (surface reaction with silicon and quartz  
 for generating surface aminopropyl  
 groups; characterization of self-assembled thin  
 films of zirconium phosphonate/aromatic  
 diimides)

INDEX TERM: 7699-43-6, Zirconyl chloride  
 ROLE: RCT (Reactant); RACT (Reactant or reagent)  
 (surface reaction with successively  
 aminopropylated and phosphonated silicon and quartz  
 for generating surface zirconate groups;  
 characterization of self-assembled thin films of  
 zirconium phosphonate/aromatic diimides)

OS.CITING REF COUNT: 7 THERE ARE 7 CAPLUS RECORDS THAT CITE THIS RECORD  
 (7 CITINGS)

DATE LAST CITED: Date last citing reference entered STN: 29 Jun 2009

OS.CITING.REFS: CAPLUS 2009:435969; 2009:220171; 2009:156271;  
 2007:1167283; 2007:448185; 2006:843380;  
 2006:45088

REFERENCE COUNT: 19 THERE ARE 19 CITED REFERENCES AVAILABLE FOR THIS  
 RECORD.

- REFERENCE(S):
- (1) Aveline, B; J Am Chem Soc 1997, V119, P11785 HCAPLUS
  - (2) Barros, T; J Photochem Photobiol, A Chem 1997, V111, P97 HCAPLUS
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  - (17) Rodrigues, M; Photochem Photobiol 1999, V70, P35 HCAPLUS
  - (18) Rodrigues, M; Thin Solid Films 2000, V371, P109 HCAPLUS
  - (19) Viehbeck, A; J Electrochem Soc 1990, V137, P1460 HCAPLUS

L37 ANSWER 3 OF 11 COMPENDEX COPYRIGHT 2010 EEI on STN

ACCESSION NUMBER: 2004-518720577 COMPENDEX Full-text  
 TITLE: A thermal stability study of alkane and aromatic thiolate self-assembled monolayers on copper surfaces

AUTHOR(S): Carbonell L.; Whelan C.M.; Kinsella M.; Maex K.  
 CORPORATE SOURCE: Carbonell L.; Whelan C.M.; Kinsella M.; Maex K. (IMEC Vzw, Kapeldreef 75, B-3001 Leuven (BE)); Kinsella M. (Department of Chemistry, Trinity College, Dublin (IE)); Maex K. (E. E. Department, Katholieke Universiteit Leuven, B-3001 Leuven (BE))

SOURCE: EMAIL: carbonel@imec.be  
 Superlattices and Microstructures European Materials Research Society 2004 (Jul 2004) Volume 36, Number 1-3, pp. 149-160, 368 p., 20 refs.  
 Editor(s): Berbezier I.; Pimpinelli A.; Hull R.;

Nozaki S.

CODEN: SUMIEK ISSN: 0749-6036  
 DOI: 10.1016/j.spmi.2004.08.033  
 Published by: Academic Press  
 Conference: European Materials Research Society  
 Strasbourg (FR), 24 May 2004-28 May 2004  
 PUBL. ITEM IDENTIFIER: S0749603604002344  
 COUNTRY OF PUBLICATION: United Kingdom  
 DOCUMENT TYPE: Journal; Article; Experimental  
 LANGUAGE: English  
 SUMMARY LANGUAGE: English  
 ENTRY DATE: Entered STN: 4 Jan 2009  
 Last updated on STN: 4 Jan 2009

2004

**ABSTRACT:** The thermal stability of 1-decanethiol (C10) and benzenethiol (BT) Self-Assembled Monolayers (SAMs) on metallic and oxidized copper surfaces has been investigated by thermal desorption spectrometry. High quality C10 and BT SAMs exhibit low thermal stabilities on clean copper surfaces with a maximum in decomposition occurring between 100 and 150 °C. The decomposition of SAMs follows different mechanisms. For the alkanethiol, a direct interaction between the alkyl group of the thiolate and the metallic copper surface is the dominant pathway for the C-S bond scission. The head group desorbs as oxidized sulfur and this is followed by the desorption of the alkyl fragments of the chain adsorbed on the clean copper surface. In the case of benzenethiol, a simultaneous desorption of the head group as oxidized sulfur and the benzene group occurs. SAM formation on the oxidized copper surface results in complete removal and/or reduction of the CuO layer. Higher SAM surface coverages on the resulting Cu/Cu<sub>2</sub>O surface result from the enhanced surface roughness of the substrate. The decomposition mechanisms and thermal stabilities of the C10 and BT SAMs are dependent on the oxidation state of the underlying substrate and the chemical nature of the chain. .COPYRG. 2004 Elsevier Ltd. All rights reserved. CLASSIFICATION CODE: 931.2 Physical Properties of Gases, Liquids and

Solids; 804.1 Organic Compounds; 802.3 Chemical Operations; 802.2 Chemical Reactions; 801.4 Physical Chemistry; 714.2 Semiconductor Devices and Integrated Circuits; 641.1 Thermodynamics; 544.1 Copper; 513.3 Petroleum Products

**CONTROLLED TERM:**

\*Paraffins; Aromatic compounds; Chemical bonds; Copper; Decomposition; Desorption; Self assembly; Surface roughness; Thermodynamic stability

**SUPPLEMENTARY TERM:**

Alkyl groups; Chemical nature; Copper surface; Thermal desorption

**ELEMENT TERMS:**

C; C\*S; C-S; Cu\*O; CuO; Cu cp; cp; O cp; Cu; Cu2O

L37 ANSWER 4 OF 11 COMPENDEX COPYRIGHT 2010 EEI on STN

**ACCESSION NUMBER:**

2004-268233044 COMPENDEX Full-text

**TITLE:**

Co-patterning chitosan and bovine serum albumin on an aldehyde-enriched glass substrate by microcontact printing

**AUTHOR(S):**

Feng Jie; Gao Changyou; Wang Bo; Shen Jiacong

**CORPORATE SOURCE:**

Feng Jie; Gao Changyou; Wang Bo; Shen Jiacong (Dept. of Poly. Sci. and Engineering, Zhejiang University, No. 38, Zheda Road, Hangzhou 310027 (CN))

**SOURCE:**

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Thin Solid Films (22 Jul 2004) Volume 460, Number 1-2, pp. 286-290, 24 refs.  
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Journal; Article; Theoretical; Experimental

**LANGUAGE:**

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**SUMMARY LANGUAGE:**

English

**ENTRY DATE:**

Entered STN: 4 Jan 2009

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**ABSTRACT:** Chitosan and bovine serum albumin were co-patterned onto a glass substrate by microcontact printing technique. The process uses a microfabricated polydimethylsiloxane stamp to transfer chitosan on an aldehyde functionalized glass substrate, followed by adding a drop of albumin solution to the patterned side and holding for 30 min. After being washed with phosphate-buffered saline and cleaned by ultrasonic, the co-patterns of chitosan and albumin, each with their own

micropatterns, were formed on the same surface. In this procedure, ultrasonic cleaning takes an important role to obtain clear patterns, whereas the printing/adding sequence has less influence. Moreover, patterns printed could give higher contrast than those assembled from solution. These co-patterns could find applications in cell localization and cell growth guidance. .COPYRG. 2004 Elsevier B.V. All rights reserved. CLASSIFICATION CODE: 812.3 Glass; 804.1 Organic Compounds; 714.2

CONTROLLED TERM: Semiconductor Devices and Integrated Circuits; 931.2 Physical Properties of Gases, Liquids and Solids; 701.1 Electricity, Basic Concepts and Phenomena; 461.2 Biological Materials; 461 Bioengineering; 462.5 Biomaterials  
\*Thin films; Aldehydes; Aromatic compounds; Biomaterials; Cells; Glass; Lithography; Polarization; Substrates; Surface structure; Thermal effects

SUPPLEMENTARY TERM: Cell-based biosensors; Microcontact printing; Self-assembled monolayers (SAM)

ELEMENT TERMS: Co

L37 ANSWER 5 OF 11 HCAPLUS COPYRIGHT 2010 ACS on STN  
ACCESSION NUMBER: 2004:946228 HCAPLUS [Full-text](#)  
DOCUMENT NUMBER: 142:80483  
ENTRY DATE: Entered STN: 09 Nov 2004  
TITLE: A thermal stability study of alkane and aromatic thiolate self-assembled monolayers on copper surfaces

AUTHOR(S): Carbonell, L.; Whelan, C. M.; Kinsella, M.; Maex, K.

CORPORATE SOURCE: IMEC vzw, Louvain, B-3001, Belg.  
SOURCE: Superlattices and Microstructures (2004 ), 36(1-3), 149-160  
CODEN: SUMIEK; ISSN: 0749-6036  
PUBLISHER: Elsevier B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
CLASSIFICATION: 66-3 (Surface Chemistry and Colloids)

ABSTRACT:  
The thermal stability of 1-decanethiol (C10) and benzenethiol (BT) self-assembled monolayers (BT) self-assembled monolayers (BT) on metallic and oxidized Cu surfaces was investigated by thermal desorption spectrometry. High quality C10 and BT SAMs exhibit low thermal stabilities on clean Cu surfaces with a maximum in decomposition occurring between 100-150°. The decomposition of SAMs follows different mechanisms. For the alkanethiol, a direct interaction between the alkyl group of the thiolate and the metallic Cu surface is the dominant pathway for the C-S bond scission. The head group desorbs as oxidized sulfur and this is followed by the desorption of the alkyl fragments of the chain adsorbed on the clean copper surface. In the case of benzenethiol, a simultaneous desorption of the head group as oxidized S and the benzene group occurs. SAM formation on the oxidized Cu surface results in complete removal and/or reduction of the CuO layer. Higher SAM surface coverages on the resulting Cu/Cu2O surface result from the enhanced \*\*\*surface\*\*\* roughness of the substrate. The decomposition mechanisms and thermal stabilities of the C10 and BT \*\*\*SAMs\*\*\* are dependent on the oxidation state of the underlying

\*\*\*substrate\*\*\* and the chemical nature of the chain.

SUPPL. TERM: decanethiol benzenethiol adsorption dissociation copper surface thermal stability

INDEX TERM: Dissociative chemisorption  
Self-assembled monolayers  
Surface roughness  
Thermal stability  
(thermal stability 1-decanethiol and benzenethiol self-assembled monolayers on Cu surfaces)

INDEX TERM: 108-98-5, Benzenethiol, properties 143-10-2, 1-Decanethiol  
ROLE: CPS (Chemical process); PEP (Physical, engineering or chemical process); PRP (Properties); PYP (Physical process); PROC (Process)  
(thermal stability 1-decanethiol and benzenethiol self-assembled monolayers on Cu surfaces)

INDEX TERM: 71-43-2, Benzene, formation (nonpreparative)  
1317-39-1, Cuprous oxide, formation (nonpreparative)  
7446-09-5, Sulfur dioxide, formation (nonpreparative)  
ROLE: FMU (Formation, unclassified); FORM (Formation, nonpreparative)  
(thermal stability 1-decanethiol and benzenethiol self-assembled monolayers on Cu surfaces)

INDEX TERM: 7440-50-8, Copper, properties  
ROLE: PRP (Properties)  
(thermal stability 1-decanethiol and benzenethiol self-assembled monolayers on Cu surfaces)

OS.CITING REF COUNT: 11 THERE ARE 11 CAPLUS RECORDS THAT CITE THIS RECORD (11 CITINGS)

DATE LAST CITED: Date last citing reference entered STN: 07 Jun 2010

OS.CITING.REFS: CAPLUS 2010:660251; 2010:127098; 2009:1182569;  
2009:1177171; 2008:1078918; 2008:602087;  
2007:1287571; 2007:115209; 2007:108457;  
2006:564752; 2006:64796

REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD.

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(2) Carbonell, L; Microelec Eng 2002, V64, P63 HCAPLUS  
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L37 ANSWER 6 OF 11 HCAPLUS COPYRIGHT 2010 ACS on STN

ACCESSION NUMBER: 2003:576481 HCAPLUS Full-text  
 DOCUMENT NUMBER: 139:266211  
 ENTRY DATE: Entered STN: 29 Jul 2003  
 TITLE: New Insights for Self-  
 Assembled Monolayers of  
 Organothiols on Au(111) Revealed by Scanning  
 Tunneling Microscopy  
 AUTHOR(S): Yang, Guohua; Liu, Gang-Yu  
 CORPORATE SOURCE: Department of Chemistry, University of  
 California, Davis, CA, 95616, USA  
 SOURCE: Journal of Physical Chemistry B (2003  
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 PUBLISHER: American Chemical Society  
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 Section cross-reference(s): 75, 76

ABSTRACT:

In the past decade, scanning tunneling microscopy (STM) has revealed new information regarding self-assembled  
 \*\*\*monolayers\*\*\* (SAMs) of organothiols on Au(111) at the  
 mol. level. The periodicity, defects, morphol., and various phases  
 during the self-assembly process have been visualized with unprecedented  
 detail. Using STM under ultrahigh vacuum, new insights regarding  
 \*\*\*SAMs\*\*\* have been revealed from the perspective of potential  
 applications in mol. devices. This article focuses on a  
 mol.-level understanding of the formation of adatom and vacancy islands  
 and reveals how the structure is impacted by introducing aromatic  
 termini. The thermal stability and thermally induced  
 structural evolution of SAMs are monitored in situ. The  
 behavior of alkanethiol moieties under local elec. field and tunneling  
 current are studied with mol. resolution Mol.-level insight regarding neg.  
 differential resistance of SAMs is also discussed.

SUPPL. TERM: thiol self assembled  
 monolayer gold surface structure STM  
 INDEX TERM: Desorption  
 (current-induced; self-assembled  
 monolayers of organothiols on Au(111)  
 studied by scanning tunneling microscopy)  
 INDEX TERM: Chemical chains  
 Crystal vacancies  
 Electric current-potential relationship  
 Electric field effects



Melting point  
 Negative resistance  
     Self-assembled monolayers  
     Surface structure  
     Thermal stability  
 Threshold potential  
 Tunneling current  
     (self-assembled  
     monolayers of organothiols on Au(111)  
     studied by scanning tunneling microscopy)

INDEX TERM: Thiols, properties  
 ROLE: CPS (Chemical process); PEP (Physical,  
 engineering or chemical process); PRP (Properties);  
 PROC (Process)

(self-assembled  
 monolayers of organothiols on Au(111)  
 studied by scanning tunneling microscopy)  
 INDEX TERM: 7440-57-5, Gold, processes  
 ROLE: CPS (Chemical process); PEP (Physical,  
 engineering or chemical process); PROC (Process)

(self-assembled  
 monolayers of organothiols on Au(111)  
 studied by scanning tunneling microscopy)  
 INDEX TERM: 100-53-8, Phenylmethanethiol 108-98-5, Benzenethiol,  
 properties 111-31-9, 1-Hexanethiol 111-88-6,  
 1-Octanethiol 112-55-0, 1-Dodecanethiol 143-10-2,  
 1-Decanethiol 4410-99-5, 2-Phenylethanethiol  
 21345-09-5, 4-Chloro-4'-mercaptobiphenyl 24734-68-7,  
 3-Phenylpropanethiol 174844-47-4  
 ROLE: CPS (Chemical process); PEP (Physical,  
 engineering or chemical process); PRP (Properties);  
 PROC (Process)

(self-assembled  
 monolayers of organothiols on Au(111)  
 studied by scanning tunneling microscopy)  
 OS.CITING REF COUNT: 137 THERE ARE 137 CAPLUS RECORDS THAT CITE THIS  
 RECORD (138 CITINGS)

DATE LAST CITED: Date last citing reference entered STN: 21 Jun 2010

OS.CITING.REFS: CAPLUS 2010:599271; 2010:676845; 2010:501757;  
 2010:501746; 2010:516341; 2010:629517;  
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HCAPLUS

L37 ANSWER 7 OF 11 COMPENDEX COPYRIGHT 2010 EEI ON STN

ACCESSION NUMBER: 2002-297023928 COMPENDEX Full-text

TITLE: Surface study of thin film gas sensors  
on a Si micro-machined substrate

AUTHOR(S): Casaletto M.P.; Kaciulis S.; Mattogno G.;  
Pandolfi L.; Scavia G.; Dori L.; Nicoletti S.;  
Severi M.; Zampolli S.

CORPORATE SOURCE: Casaletto M.P.; Kaciulis S.; Mattogno G.;  
Pandolfi L.; Scavia G. (Institute of Materials  
Chemistry, CNR, P.O. Box 10, I-00016 Monterotondo  
Scalo (RM) (IT)); Dori L.; Nicoletti S.; Severi  
M.; Zampolli S. (LAMEL Institute, CNR, Via P.  
Gobetti 101, 40129 Bologna (IT))  
EMAIL: pia.casaletto@mlib.cnr.it

SOURCE: Applied Surface Science (14 Apr 2002)  
Volume 189, Number 1-2, pp. 39-52, 18 refs.  
CODEN: ASUSEE ISSN: 0169-4332  
DOI: 10.1016/S0169-4332(01)01034-0  
Published by: Elsevier

PUBL. ITEM IDENTIFIER: S0169433201010340

COUNTRY OF PUBLICATION: Netherlands

DOCUMENT TYPE: Journal; Article; Theoretical; Experimental

LANGUAGE: English

SUMMARY LANGUAGE: English

ENTRY DATE: Entered STN: 4 Jan 2009  
Last updated on STN: 4 Jan 2009

**ABSTRACT:** The miniaturisation of gas sensors and the compatibility of their fabrication process with modern microelectronics technology are very important aspects of gas-sensing development. The reduction of power consumption could minimise not only thermal stresses and device degradation, but also enable to use battery operated sensors and smart sensor arrays. In the present work, variously surface-activated films of tin oxide deposited on a Si micro-machined substrate, which contained a Si3N4 membrane supporting the entire gas-sensing structure, have been investigated. Due to the very small thermal mass of the membrane, these devices can be operated in fast-pulsed temperature powering regime. The results of the measurements of gas sensitivity to aromatic hydrocarbons in fast-pulsed mode are presented and discussed. The gas sensitivity and device reliability are analysed on the basis of these results and the data of surface analysis of the sensors. The

surface analysis of the samples has been carried out by using selected-area X-ray photoelectron spectroscopy (SA-XPS), SA-XPS depth profiling with cyclic Ar<sup>+</sup> ion sputtering, scanning Auger microscopy (SAM) and scanning tunnelling microscopy (STM). These analytical techniques enable us to investigate the microchemical composition and morphology of the gas-sensing layers, both before and after the gas detecting cycles in real working conditions. .COPYRG. 2002 Elsevier Science B.V. All rights reserved.

## CLASSIFICATION CODE:

931.2 Physical Properties of Gases, Liquids and Solids; 931 Applied Physics Generally; 804.2 Inorganic Compounds; 804.1 Organic Compounds; 931.3 Atomic and Molecular Physics; 802.2 Chemical Reactions; 714.2 Semiconductor Devices and Integrated Circuits; 712.1.1 Single Element Semiconducting Materials; 604.2 Machining Operations; 801 Chemistry

## CONTROLLED TERM:

\*Chemical sensors; Aromatic hydrocarbons; Composition; Degradation; Membranes; Micromachining; Morphology; Scanning tunneling microscopy; Semiconducting silicon; Sputtering; Substrates; Surface phenomena; Thermal stress; Thin films; Tin compounds; X ray photoelectron spectroscopy

## SUPPLEMENTARY TERM:

Scanning Auger microscopy (SAM)

## ELEMENT TERMS:

Si; Si; N\*Si; Si3N; Si cp; cp; N cp; Ar

L37 ANSWER 8 OF 11 HCAPLUS COPYRIGHT 2010 ACS on STN DUPLICATE 1

ACCESSION NUMBER: 2001:766803 HCAPLUS Full-text

DOCUMENT NUMBER: 135:377217

ENTRY DATE: Entered STN: 23 Oct 2001

TITLE: Self-Assembled

Monolayers of Aromatic Thiol and Selenol on Silver: Comparative Study of Adsorptivity and Stability

AUTHOR(S): Han, Sang Woo; Lee, Seung Joon; Kim, Kwan

CORPORATE SOURCE: Laboratory of Intelligent Interface School of Chemistry and Molecular Engineering and Center for Molecular Catalysis, Seoul National University, Seoul, 151-742, S. Korea

SOURCE: Langmuir (2001), 17(22), 6981-6987

CODEN: LANGD5; ISSN: 0743-7463

PUBLISHER: American Chemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

CLASSIFICATION: 66-4 (Surface Chemistry and Colloids)

## ABSTRACT:

The authors have studied comparative adsorptivities and relative stabilities of self-assembled monolayers of thiol (benzenethiol, BT) vs. selenol (benzeneselenol, BSe) on a Ag \*\*\*surface\*\*\* by diffuse reflectance IR Fourier transform (DRIFT) spectroscopy and surface-enhanced Raman spectroscopy (SERS). BT and BSe are chemisorbed on Ag as benzenethiolate and benzeneselenolate, resp., after deprotonation with a tilted orientation with respect to the substrate surface; the benzene rings of BT and BSe are tilted by 25° and 37°, resp., from the substrate normal. Competitive adsorption expts. show that adsorption of BT is more favorable by 0.3 kcal/mol. Temp.-dependent DRIFT spectra indicated that the monolayer of benzenethiolate on Ag is \*\*\*thermally\*\*\* more stable than that of benzeneselenolate. This could be evidenced from the fact that the vibrational peaks of the benzenethiolate species were obsd. up to 458 K, while those of

benzeneselenolate became substantially weakened around 418 K. The more neg. desorption potential of the BT monolayer clearly indicates that the benzenethiolate binds more strongly to the Ag surface than the benzeneselenolate does.

SUPPL. TERM: self assembled monolayer  
benzenethiol benzeneselenol adsorption silver;  
SAM benzenethiol benzeneselenol adsorption silver

INDEX TERM: Self-assembled monolayers  
(adsorptivity and stability of self-assembled monolayers of aromatic thiol and selenol on silver)

INDEX TERM: Adsorption  
(competitive; adsorptivity and stability of self-assembled monolayers of aromatic thiol and selenol on silver)

INDEX TERM: IR reflectance spectra  
(diffuse; of benzenethiol and benzeneselenol adsorbed on Ag)

INDEX TERM: SERS (Raman scattering)  
(of benzenethiol and benzeneselenol adsorbed on Ag)

INDEX TERM: 108-98-5, Benzenethiol, processes 645-96-5, Benzeneselenol  
ROLE: PEP (Physical, engineering or chemical process); PROC (Process)  
(adsorptivity and stability of self-assembled monolayers of aromatic thiol and selenol on silver)

INDEX TERM: 7440-22-4D, Silver, complexes, properties  
13133-62-5D, Benzenethiolate, silver-bound, properties  
14971-39-2D, Benzeneselenolate, silver-bound  
ROLE: PRP (Properties)  
(on surface; adsorptivity and stability of self-assembled monolayers of aromatic thiol and selenol on silver)

OS.CITING REF COUNT: 59 THERE ARE 59 CAPLUS RECORDS THAT CITE THIS RECORD (59 CITINGS)

DATE LAST CITED: Date last citing reference entered STN: 25 Jun 2010

OS.CITING.REFS: CAPLUS 2010:755245; 2010:466007; 2010:250596;  
2009:1605401; 2009:1412446; 2009:1308360;  
2009:1268176; 2009:897092; 2009:963119;  
2009:779243; 2009:31646; 2008:1058873;  
2008:1017677; 2008:900785; 2008:859310;  
2008:812788; 2008:561250; 2008:498898;  
2008:428924; 2008:421348; 2008:144932;  
2008:23202; 2007:1318551; 2007:1170823;  
2007:1137454; 2007:862268; 2007:829554;  
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2005:1319367; 2005:1255156; 2005:1113435;  
2005:1040039; 2005:700672; 2005:655364;  
2005:538765; 2005:262209

REFERENCE COUNT: 66 THERE ARE 66 CITED REFERENCES AVAILABLE FOR THIS RECORD.

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L37 ANSWER 9 OF 11 COMPENDEX COPYRIGHT 2010 EEI ON STN

ACCESSION NUMBER: 1999-160016368 COMPENDEX Full-text

TITLE: Surface-enhanced Raman scattering  
(SERS) from azobenzene self-assembled  
'sandwiches'

AUTHOR(S): Yu Hua-Zhong; Zhang Jin; Zhang Hao-Li; Liu  
Zhong-Fan

CORPORATE SOURCE: Yu Hua-Zhong; Zhang Jin; Zhang Hao-Li; Liu  
Zhong-Fan (Peking Univ, Beijing (CN))

SOURCE: Langmuir {1999} Volume 15, Number 1,  
pp. 16-19, 17 refs.  
CODEN: LANGD5 ISSN: 0743-7463  
DOI: 10.1021/la981032r  
Published by: ACS

DOCUMENT TYPE: Journal; Article; Experimental  
LANGUAGE: English

ENTRY DATE: Entered STN: 3 Jan 2009  
Last updated on STN: 3 Jan 2009

ABSTRACT: A silver island film was thermally deposited on the top  
of an azobenzene self-assembled  
monolayer on gold, yielding a SERS-active system possessing a 'sandwiched'  
structure of Ag|R1-Azo-R2S-|Au. For the first time, the positions of the Azo groups  
were controlled by using azobenzenealkaneethiols with different terminal groups (R1)  
or interchain spacers (R2), to clarify the relationship between the SERS effect and  
the structural nature of the system. As will be shown, increases in distances of Azo  
groups from the gold substrate and from the silver film both cause the enhancement  
factor to decay exponentially, indicating that the enhancement correlates to both  
the gold substrate underneath and the silver islands above.

CLASSIFICATION CODE: 531 Metallurgy and Metallography; 547.1 Precious  
Metals; 801 Chemistry; 804.1 Organic Compounds;  
813.2 Coating Materials; 931.2 Physical  
Properties of Gases, Liquids and Solids  
CONTROLLED TERM: \*Multilayers; Aromatic compounds; Gold;  
Metallic films; Molecular structure; Monolayers;  
Nitrogen compounds; Silver; Substrates;

SUPPLEMENTARY TERM: Surface structure  
 Azobenzene; Self-assembled monolayers  
 (SAM); Surface-enhanced Raman  
 scattering (SERS)

L37 ANSWER 10 OF 11 HCAPLUS COPYRIGHT 2010 ACS on STN  
 ACCESSION NUMBER: 1996:283291 HCAPLUS Full-text  
 DOCUMENT NUMBER: 125:42367  
 ORIGINAL REFERENCE NO.: 125:8031a,8034a  
 ENTRY DATE: Entered STN: 14 May 1996  
 TITLE: Structure and stability of self-  
 assembled monolayers  
 AUTHOR(S): Delamarche, E.; Michel, B.  
 CORPORATE SOURCE: IBM Research Division, Zurich Research  
 Laboratory, Rueschlikon, CH-8803, Switz.  
 SOURCE: Thin Solid Films (1996), 273(1-2),  
 54-60  
 CODEN: THSFAP; ISSN: 0040-6090  
 PUBLISHER: Elsevier  
 DOCUMENT TYPE: Journal; General Review  
 LANGUAGE: English  
 CLASSIFICATION: 66-0 (Surface Chemistry and Colloids)  
 Section cross-reference(s): 36, 75

## ABSTRACT:

A review of high gap impedance STM studies of nanoscale mol. domains  
 having several stable mol. conformations of alkanethiol monolayers  
 self-assembled from alkanethiols on Au. Thermal annealing of  
 the monolayers in air causes a small loss of mols. due to evaporation, but the  
 \*\*\*surface\*\*\* remains defect free and stable because mol. chains can  
 compensate for missing rows of mols. The mol. packing of the  
 unfunctionalized alkanethiols is dominated by the spacing of S on Au  
 (111). In contrast, monolayers made from azobenzene functionalized  
 thiols show a packing that is dominated by the end group. The mols.  
 expose the upper edges of the phenyls to the surface and allow  
 detection of pair-wise aromatic interactions between. 33 Refs.

SUPPL. TERM: review STM thiol self assembled  
 monolayer; azobenzene thiol monolayer gold STM  
 review

INDEX TERM: Chains, chemical  
 Surface structure  
 (STM study of azobenzene-functionalized thiol  
 self-assembled monolayers  
 on Au (111))

INDEX TERM: Thiols, properties  
 ROLE: PRP (Properties)  
 (STM study of azobenzene-functionalized thiol  
 self-assembled monolayers  
 on Au (111))

INDEX TERM: Functional groups  
 (azobenzene; STM study of azobenzene-functionalized  
 thiol self-assembled  
 monolayers on Au (111))

INDEX TERM: Chemisorbed substances  
 (self-assembled  
 monolayers; STM study of  
 azobenzene-functionalized thiol self-  
 assembled monolayers on Au (111))

INDEX TERM: Microscopy, electron  
 (scanning tunneling, STM study of

azobenzene-functionalized thiol self-assembled monolayers on Au (111))

INDEX TERM: 7440-57-5, Gold, uses  
 ROLE: NUU (Other use, unclassified); USES (Uses)  
 (substrate; STM study of  
 azobenzene-functionalized thiol self-assembled monolayers on Au (111))

OS.CITING REF COUNT: 42 THERE ARE 42 CAPLUS RECORDS THAT CITE THIS RECORD (42 CITINGS)

DATE LAST CITED: Date last citing reference entered STN: 12 Mar 2009

OS.CITING.REFS: CAPLUS 2009:238694; 2009:127243; 2009:31599;  
 2009:24166; 2008:1314568; 2008:549767;  
 2007:388136; 2007:189407; 2006:535043;  
 2006:328222; 2005:1346707; 2005:453059;  
 2005:436128; 2003:980935; 2003:915634;  
 2003:877663; 2003:576481; 2003:476166;  
 2002:477120; 2002:106472; 2002:90682;  
 2002:64478; 2001:817475; 2001:810060;  
 2001:745155; 2001:656980; 2001:603163;  
 2001:215618; 2001:214605; 2001:71552;  
 2000:770248; 2000:493932; 2000:476155;  
 1999:777200; 1999:521095; 1998:465571;  
 1998:392776; 1998:266690; 1998:36633;  
 1997:548593; 1997:377915; 1997:351115

L37 ANSWER 11 of 11 JAPIO (C) 2010 JPO on STN

ACCESSION NUMBER: 2008-277469 JAPIO Full-text

TITLE: METHOD FOR EXPOSING PHOTSENSITIVE SAM  
 FILM, AND METHOD FOR MANUFACTURING SEMICONDUCTOR  
 DEVICE

INVENTOR: ARAI TADASHI; SHIBA TAKEO; ANDO MASAHICO

PATENT ASSIGNEE(S): HITACHI LTD

PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2008277469	A	20081113	Heisei	

## APPLICATION INFORMATION

STN FORMAT: JP 2007-117955 20070427

ORIGINAL: JP2007117955 Heisei

PRIORITY APPLN. INFO.: JP 2007-117955 20070427

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined  
 Applications, Vol. 2008

## ABSTRACT:

PROBLEM TO BE SOLVED: To dramatically reduce a cost by using a photo mask for positioning since an electrode substrate, where a lower electrode and an upper electrode are excellently positioned via an insulating film, is hardly formed due to a position deviation in a printing method.

SOLUTION: This photosensitive SAM film exposing method is a method for depositing, on the substrate, a self-assembled monomolecular film (a photosensitive SAM film) having photosensitivity, and indicating liquid repellency before photosensitization and lyophilic after photosensitization and allowing the deposited surface of the substrate to be in a soaked state in a liquid or in a contact state with the liquid with a photosensitive surface facing down, and then, exposing the substrate. Exposure light is UV light or visible light, and its wavelength is  $\geq 350$  nm and  $\leq 800$  nm. The liquid is at least one of organic solvents containing aromatic rings and organic solvents of alcohol ether or ketones.

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(FILE 'HOME' ENTERED AT 14:43:54 ON 22 JUL 2010)

FILE 'HCAPLUS' ENTERED AT 14:44:27 ON 22 JUL 2010  
E US20070140901/PNL1 1 S E3  
SEL RNL2 FILE 'REGISTRY' ENTERED AT 14:46:26 ON 22 JUL 2010  
16 S E1-16FILE 'HCAPLUS' ENTERED AT 15:08:38 ON 22 JUL 2010  
L3 19833 S SELF(W)ASSEMBL?(W) (MONOLAYER? OR MONO(W)LAYER?)  
L4 QUE SAM  
L5 QUE SUBSTRATE  
L6 QUE ARTICLE OR WORKPIECE OR WORK(W)PIECE  
L7 8194 S L3-4 AND L5-6  
L8 7201 S L7 AND L3  
L9 QUE SURFACE  
L10 5899 S L7 AND L9  
L11 5600 S L10 AND L8  
L12 QUE THERMAL?  
L13 280 S L11 AND L12  
L14 QUE ARYL OR AROMATIC?  
L15 QUE ALICYCLIC?  
L16 205 S L11 AND L14-15  
L17 11 S L13 AND L16  
L18 210 S L7 AND L9 AND L14-15  
L19 12 S L18 AND L12  
L20 1 S L19 NOT L17  
L21 6 S L17 AND (PY<=2006 OR PRY<=2006 OR AY<=2006)FILE 'WPIX' ENTERED AT 15:35:58 ON 22 JUL 2010  
E US20070140901/PN  
L22 1 S E3  
L23 939 S L7  
L24 660 S L23 AND L9  
L25 107 S L24 AND L14-15  
L26 15 S L25 AND L12  
L27 15 S L26 AND L3  
L28 QUE PROCESS OR METHOD  
L29 13 S L27 AND L28  
L30 11 S (L27 OR L29) AND (PY<=2006 OR PRY<=2006 OR AY<=2006)L31 FILE 'JAPIO' ENTERED AT 15:41:30 ON 22 JUL 2010  
1 S L25FILE 'COMPENDEX' ENTERED AT 15:45:10 ON 22 JUL 2010  
L32 91 S L25  
L33 7 S L32 AND L12  
L34 6 S L33 AND PY<=2006FILE 'WPIX' ENTERED AT 15:46:48 ON 22 JUL 2010  
SEL L30 PN,AP

FILE 'HCAPLUS' ENTERED AT 15:47:51 ON 22 JUL 2010

L35 14 S E1-83  
L36 5 S L21 NOT L35

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L37 11 DUP REM L36 L31 L34 (1 DUPLICATE REMOVED)

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